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PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

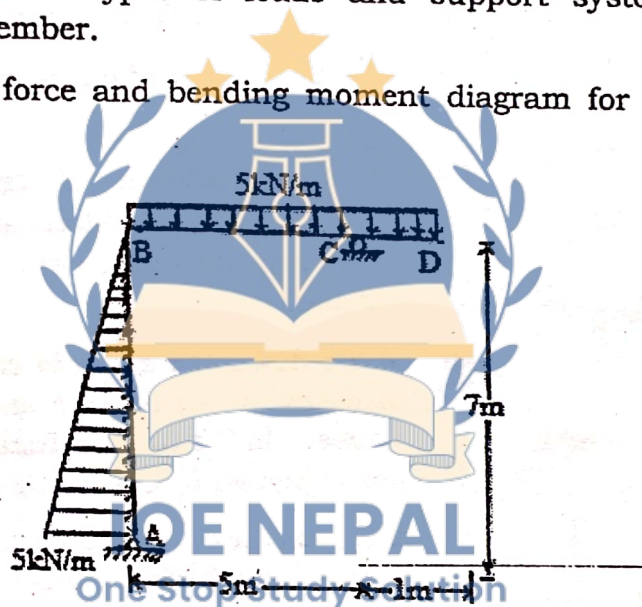
BEG256CI: Strength of Materials (New Course)

Candidates are required to give their answers in their own words as far as practicable.

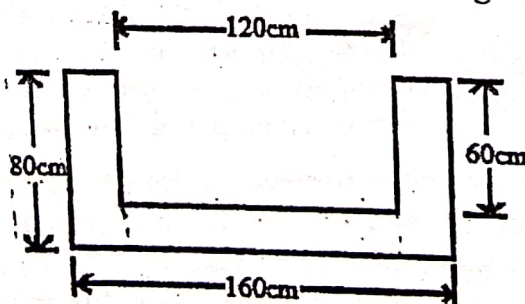
All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume necessary data if required.

Answer FIVE questions.

- 1(a) Explain different types of loads and support systems in a structural member. 4
- (b) Draw shear force and bending moment diagram for the given frame. 12



- 2(a) Compare hollow and solid shaft in term of power transmission. 4
- (b) Find the principal moment of inertia for the given section. 12



Contd. ...

(2)

- 3(a) A cylindrical boiler of 3.5m external diameter is made up of 50mm thick plates. Find the various stresses in the plates, if the boiler is subjected to an internal pressure of 200MPa. Take efficiency of circumferential joints as 0.75 and of longitudinal joints as 0.85. 8
- (b) A steel cube block of 450mm side is subjected to a force of 50kN tensile, 90kN compressive and 45kN tensile along three mutually perpendicular directions. Determine the change in dimension and volume of block. Take Modulus of elasticity as 200GPa and Poisson's ratio as 0.2. 8
- 4(a) Find the elongation of solid circular taper bar due to a tensile force. 8
- (b) A short column of cross-section 450×450 mm carries an eccentric load of 150kN at a point 150mm from the both planes bisecting the sides. Find the stress developed at each corner of column. 8
- 5(a) Write down the steps to construct Mohr's circle for determining stresses on an oblique section of a body subjected to a direct stress in two mutually perpendicular directions and accompanied by shear stress. 8
- (b) A column of timber section is $15\text{cm} \times 20\text{cm}$ is 5.5m long, both ends being fixed. If the young's modulus of elasticity for timber is 17.5kN/mm^2 determine: (i) crippling load, (ii) safe load for the column if factor of safety is 3. 8
- 6(a) A solid circular shaft and hollow circular shaft whose inside diameter is $3/4^{\text{th}}$ of the outside diameter are of same material of equal lengths and are required to transmit a given torque. Compare the weights of these two shafts if the maximum shear stress developed in the two shafts are equal. 8
- (b) A cantilever I beam of flanges $40\text{cm} \times 10\text{cm}$ each and web $80\text{cm} \times 10\text{cm}$ is used over a span of 7.5m. It carries uniformly distributed load of 60 kN/m run. Find the maximum stress induced in the beam due to bending. 8

PURBANCHAL UNIVERSITY

2017

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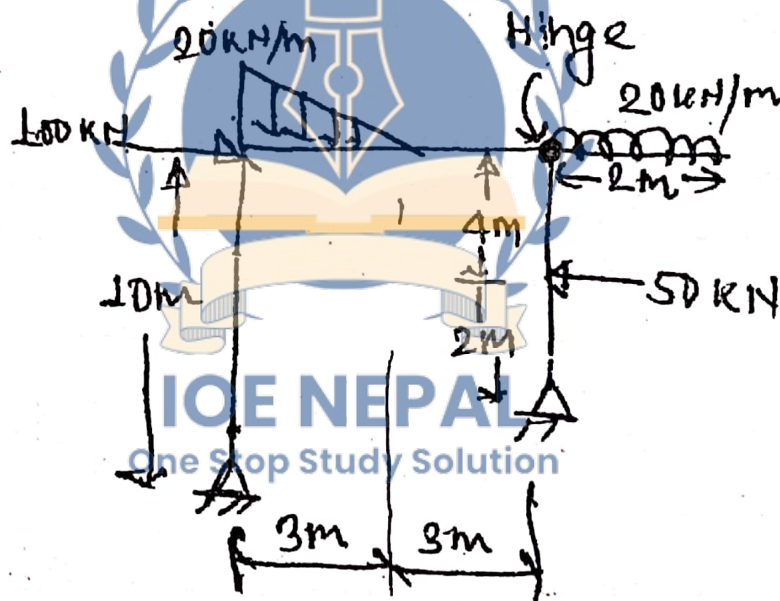
BEG256CI: Strength of Materials (New Course)

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Answer FIVE questions.

- 1(a) Explain indeterminacy of structure and determine the conditions required for different types of structure with perfect examples with full concepts. 4
- (b) Draw SFD and BMD diagram of given structure. 12



- ✓ 2(a) Determine the deformation of tapered member under axial loading. 6
- (b) A rectangular block of material is subjected to a tensile stress of 100MN/m^2 on one plane and a tensile stress of 50MN/m^2 on a plane at right angles, together with the shear stresses of 60MN/m^2 on the same planes. Find; 14
- (i) The magnitude of the principal stresses
- (ii) The direction of the principal planes
- (iii) The magnitude of the greatest shear stress. 10

Contd. ...

(2)

3(a) ✓ An R.C.C. circular columns have a diameter of 300 mm and it is reinforced with 8 steel bars. The total area of steel bars is 2513mm^2 . The column carries a load of 250 kN. If the modulus of elasticity for steel is 18 times that of concrete, find the stresses in concrete and steel. 10

(b) Explain the assumption of flexure theory and also prove that the neutral axis passes through the centroid of beam under pure bending moment. 6

4(a) ✓ A solid shaft is to transmit 400 kW at 200 rpm . If the shear stress is not to be exceed 100 MPa . What percentage saving in weight would be obtained if this shaft is replaced by a hollow one whose internal diameter is 0.6 of the external diameter, if remaining parameters are same, also calculate the diameter of solid shaft. 8

(b) A hollow mild steel tube 5m long and of circular cross section is to have an outside diameter of 45mm. Calculate the necessary internal diameter to prevent failure by buckling if the safe load is 2500N. It is used as a strut with both ends hinged. Take factor of safety as 2.5 and $E = 2 \times 10^5 \text{ N/mm}^2$. 8

a) A boiler is subjected to an internal steam pressure of 5 MPa . The diameter of the boiler plates is 10cm and permissible tensile stress is 240 MPa . Find out the thickness of plate when efficiency for longitudinal joint is 80% and that of circumferential joints is 50%. 8

) A hollow circular column having external and internal diameter of 40cm and 30cm respectively carries a vertical load of 150kN at the outer edge of the column. Calculate the maximum and minimum intensities of stress in the section. 8

/ An I beam of flanges $20\text{ cm} \times 2\text{ cm}$ and web $30\text{ cm} \times 1\text{ cm}$ is acted on by a shearing force of 200 kN. Determine: (8)

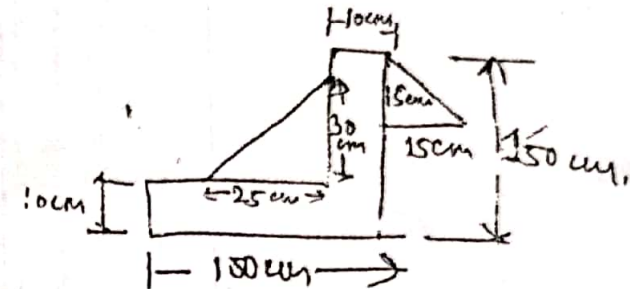
(i) The maximum and minimum shearing stress in the web

(ii) Maximum shear stress in the flange. 4

(iii) The shearing stress at a layer 6 cm below the top of the section. Show the above stresses in the stress distribution diagram.

(3)

(b) Determine the principal moment of inertia and locate the principal axes of figure shown below.



PURBANCHAL UNIVERSITY

2016

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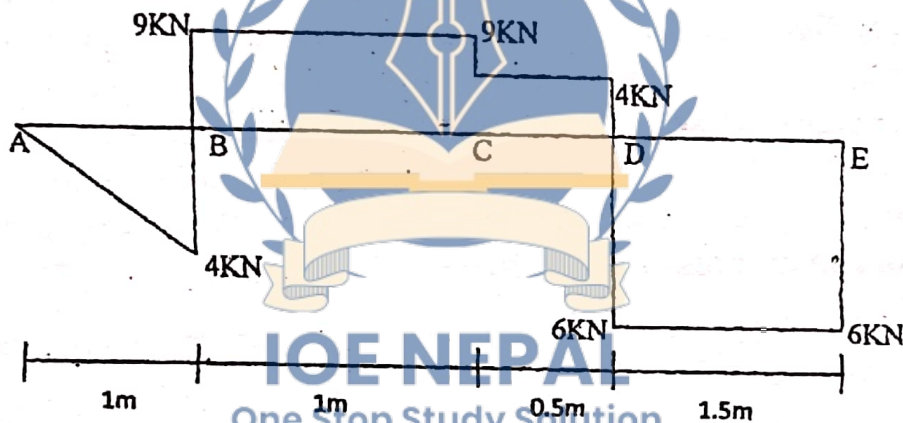
BEG256CI: Strength of Materials (New Course)

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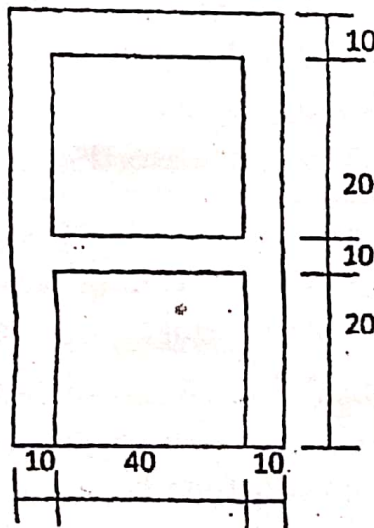
All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume necessary data if required.

Answer FIVE questions.

- 1(a) Write types of supports with neat sketch. 4
- (b) The shear force diagram of a beam 4m in length is shown in fig. Determine the loading and hence draw the bending moment diagrams. 12



- 2(a) Locate the centroid of the lamina as shown in the fig. Also calculate the moment of inertia about the centroidal axis XX and YY. All dimensions are in mm. 8



Contd. ...

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(2)

- (b) Define the modulus of rigidity. Drive the relation between modulus of elasticity (E) and modulus of rigidity (G) in terms of poisson's ratio ($1/m$). 8
- 3(a) A steel rod of 30mm diameter is enclosed centrally in a hollow copper tube of external diameter 50mm and internal 40mm. The composite member is then subjected to an axial pull of 55KN. If the length of each (rod and tube) is equal to 250mm, determine the stress in the rod and tube. Also determine the load carried by rod and tube. 8
- (b) Derive the normal stress and shear stress when stress on an inclined plane subjected to two mutually perpendicular normal stresses. 8
- 4(a) A rectangular block of material is subjected to a tensile stress of 110N/mm^2 on one plane and a tensile stress of 47N/mm^2 on the plane at right angle to the former. Each of the above stresses is accompanied by a shear stress of 63N/mm^2 and that associated with the former tensile stress tends to rotate the block anticlockwise. Find the direction and magnitude of each of the principal stress and also determine the magnitude of the greatest shear stress. 8
- (b) A cast iron water main 2m long 450mm inside diameter and 20mm wall thickness runs full of water and is supported at its ends. Calculate the maximum stress in the metal if density of cast iron is 70.6KN/m^3 and that of water is 9.81KN/m^3 . 8
- 5(a) Design a suitable diameter for a circular shaft required to transmit 80.2KW at 180 r.p.m. The shear stress in the shaft is not to exceed 70MN/m^2 and the maximum torque exceeds the mean by 40%. Also calculate the angle of twist in a length of 2m. Take $C=90\text{GN/m}^2$. 8
- (b) A cylindrical shell is 3m long and is having 1m internal diameter and 15mm thickness. Calculate the maximum intensity of shear stress induced and also the change in the dimension of the shell if it is subjected to an internal fluid pressure of 1.5N/mm^2 . Take $E=200000\text{N/mm}^2$ and $1/m=0.3$. 8

Contd. ...

(3)

- 6(a) A column section 300mm external diameter and 150mm internal diameter supports an axial load of 2600KN and an eccentric load of $P\text{KN}$ at an eccentricity of 400mm. If the compressive and tensile stresses are not to exceed 140N/mm^2 and 60N/mm^2 respectively, find the magnitude of the load P ? 8
- (b) Compare the ratio of the strength of a solid steel column to that of a hollow of the same cross-sectional area. The internal diameter of the hollow column is $3/4$ of the external diameter. Both the columns have the same length and are pinned at the ends. 8



PURBANCHAL UNIVERSITY

2015

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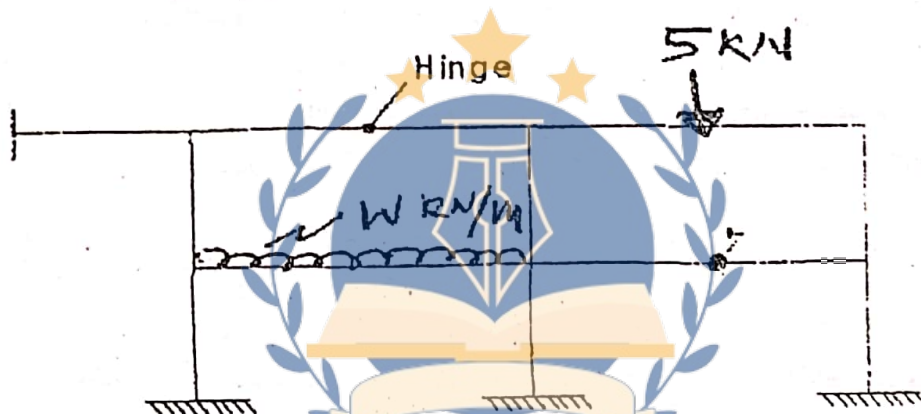
BEG256CI: Strength of Materials (New Course)

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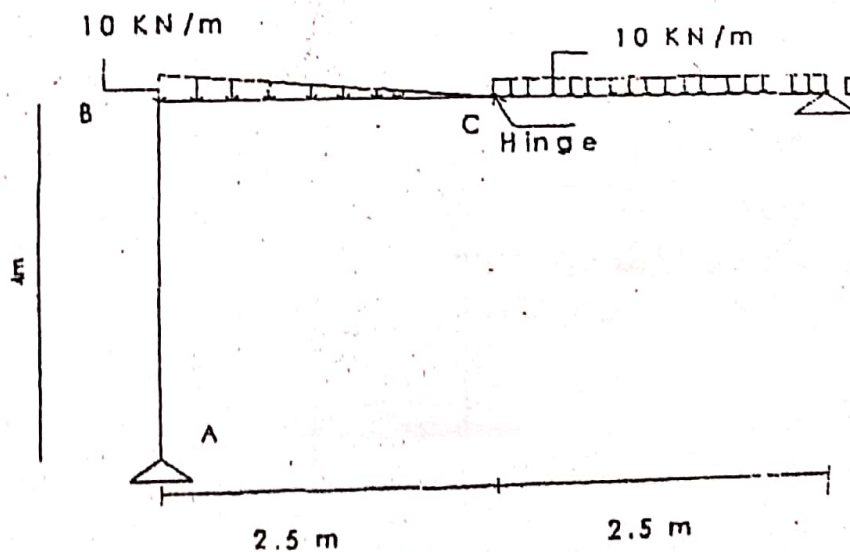
All questions carry equal marks. The marks allotted for each sub-question is specified along its side. Assume necessary data if required.

Answer FIVE questions.

- 1(a) Find out the degree of static indeterminacy of the structure shown in Fig. 1(a). 4



- (b) Find and draw Axial force, Shear force and Bending moment diagram of the given frame loaded showing all the salient features as shown in figure 1(b). 12



Contd. ...

(2)

2(a) Define Poisson's ratio and derive the relationship between Modulus of elasticity and Modulus of Rigidity. 6

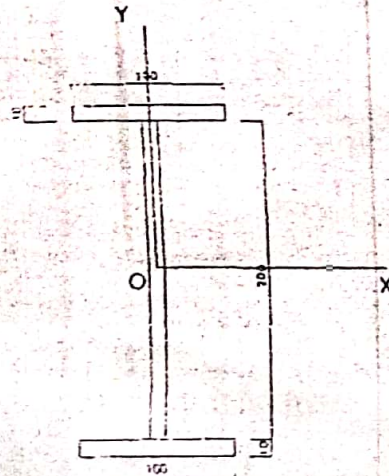
(b) A compound bar consists of circular rod of steel of diameter 20mm rigidly fitted into a copper tube of internal diameter 20mm and thickness 5mm. If the bar is subjected to a load of 150 kN, find the stresses developed on the two materials. Take E for steel = 200 kN/mm², E for copper = 120 kN/mm². 10

3(a) Derive the Pure Bending equation. 6

(b) At a certain point in a strained material the intensities of normal stresses on two planes at right angles to each other are 30N/mm² and 15N/mm² both tensile. They are accompanied by shear stress of 15N/mm². Find the principal planes and principal stresses. Find also the maximum shear stress. 10

4(a) A Cylindrical shell is 3m long, and is having 1.2m internal diameter and 15mm thickness. Calculate the maximum intensity of shear stress induced and also the changes in the dimensions of the shell if it is subjected to an internal fluid pressure of 1.5 N/mm². 7

(b) For the section shown in below, determine: (i) the principal axes of the section about O, (ii) the values of the principal moments of inertia of the section about O. All dimension are mm. 9



(3)

5(a) Derive the expressions for the shear stress of a rectangular section. 6

(b) A simply supported beam of section 200mm×400mm, 3m long, just fails in flexure when a load of 20kN placed at its center. A cantilever beam of same material and having rectangular section 150mm wide and 300mm deep over a span of 3m. Calculate the concentrated load required to break the beam at its free end. 10

6(a) Calculate the critical load of a strut which is made of a bar, square in section and 4m long and which is fixed at both ends. The same bar when simply supported gives a mid-span deflection of 5mm with a load of 15N at the center. 8

(b) Determine the diameter of solid shaft which will transmit 440kW at 280 rpm. The angle of twist must not exceed one degree per meter length and the maximum torsional shear stress is to be limited to 40 N/mm². Assume $G = 84 \text{ kN/mm}^2$. 8

IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY

2014 (NEW)

B.E. (Civil)/Third Semester/Final

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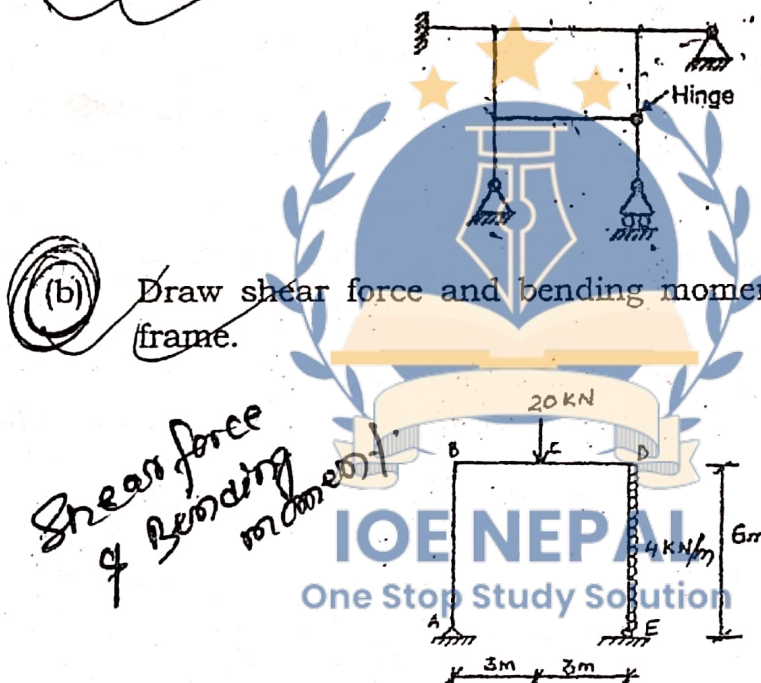
BEG256CI: Strength of Materials

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All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Determine the degree of static indeterminacy of given structure. (4)



2(a) Define the terms ultimate stress, allowable stress, bulk modulus. 6

(b) A reinforced concrete column of 60 cm diameter supports a load of 750 kN. The reinforcement consists of 8 steel rods each of 3 cm in diameter. Find how much load is carried by the rods and the concrete if modulus of elasticity of steel is 15 times that of concrete. If stress in concrete should not exceed 3 N/mm², find the number of steel rods required for reinforcement so that the column can support a load of 900 kN. 10

Contd. ...

(2)

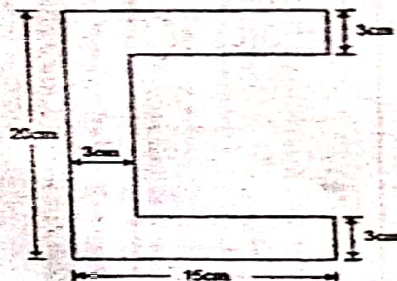
3(a) Describe the graphical method to determine the principal stress. 6

(b) The principal stresses at a point across two perpendicular planes are 70 MN/m^2 (tensile) and 30 MN/m^2 (tensile). Find the normal, tangential stresses and resultant stress and its obliquity on a plane at 25° with major principal plane. 10

4(a) A solid shaft of 160 mm diameter is to be replaced by a hollow shaft of the same material with internal diameter equal to 60% of the external diameter. Find the saving in material, if maximum allowable shear stress is the same for both the shafts. 8

(b) A short column of rectangular cross section $80 \times 60 \text{ mm}$ carries a load of 60 kN at a point 25 mm from the longer side and 40 mm from the shorter side. Determine the maximum compressive and tensile stresses in the section. 8

5(a) Determine the moment of inertia about the centroidal axes for the channel section shown below. 8



IOE NEPAL

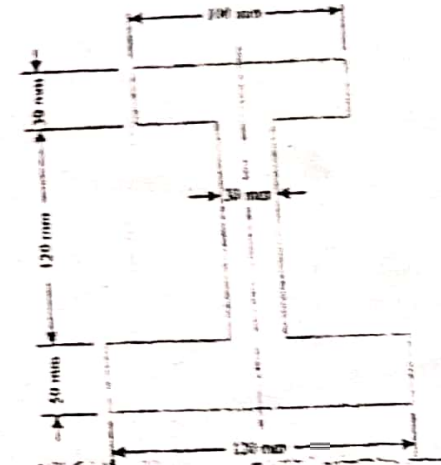
One Stop Study Solution

(b) A boiler shell is to be made of 20 mm thick plate having a limiting tensile stress of 120 MN/m^2 . If the longitudinal and circumferential efficiencies are 70% and 30% respectively, determine what maximum diameter of the shell would be allowed for a maximum pressure of 3 MN/m^2 . 8

6(a) A hollow cylindrical column 6 m in length when hinged at both the ends, has a critical buckling load of $P \text{ KN}$. When the column is fixed at both the ends, its critical load rises to $(P+50000) \text{ KN}$. If the ratio of external diameter to internal diameter is 1.25 and $E = 2 \times 10^5 \text{ N/mm}^2$, determine external diameter of the column. 8

(3) Theory of flexure.

(b) A beam simply supported at ends having cross section as shown in fig is loaded with a UDL over whole of its span. If the beam is 10 m long, find the UDL if maximum permissible bending stress in tension is limited to 35 MN/m^2 and in compression to 55 MN/m^2 . What are the actual maximum bending stresses set up in the section? 8



$$\frac{d_e}{d_i} = 1.25$$

$$P = \frac{\pi^2 E I}{L^2}$$

$$P = \frac{\pi^2 E \frac{\pi}{4} (d_o^4 - d_i^4)}{L^2}$$

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PURBANCHAL UNIVERSITY

2013

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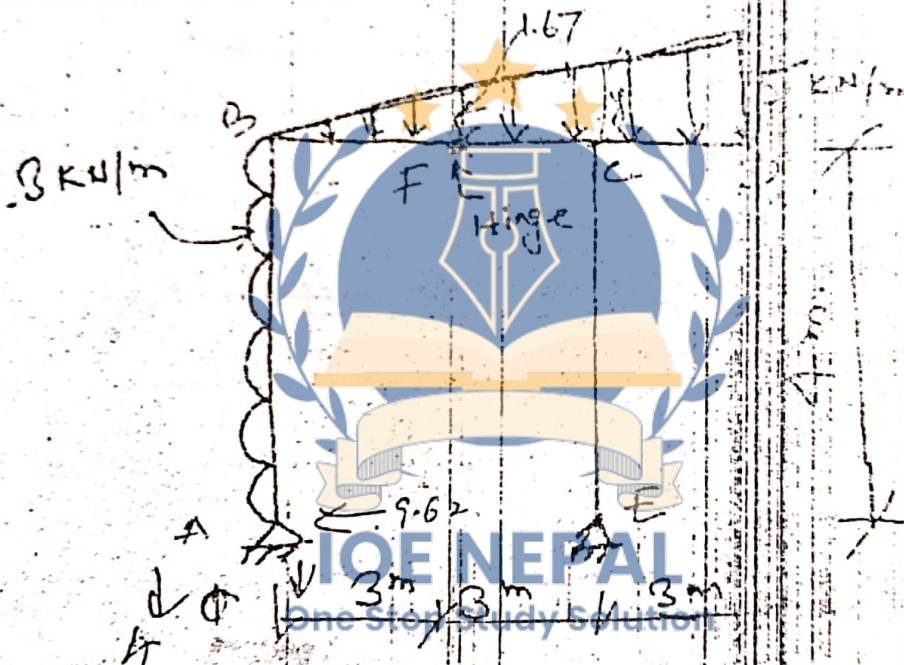
BEG256CI: Strength of Materials (New Course)

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Answer FIVE questions.

1. Draw Axial force diagram, shear force diagram and bending moment diagram of given frame.



- 2(a) Find an expression for total elongation of a bar due to its own weight when the bar is fixed at its upper end and hanging freely at the lower end.

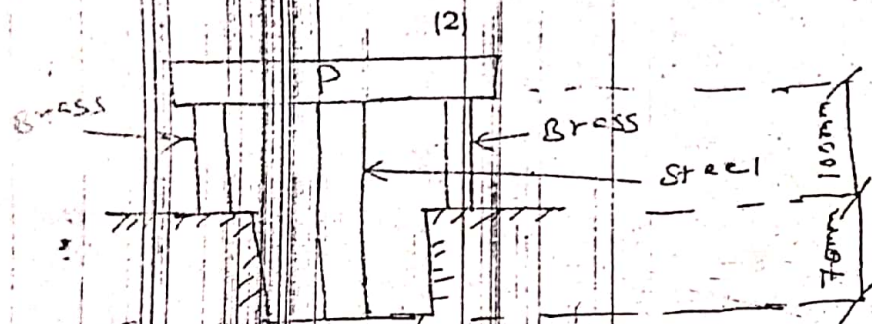
$$\frac{WL}{2E}$$

- (b) Two brass rods and one steel rod together support a load as shown in fig. If the stress in brass and steel are not to exceed 60N/mm^2 and 120N/mm^2 , find the safe load that can be supported. Take

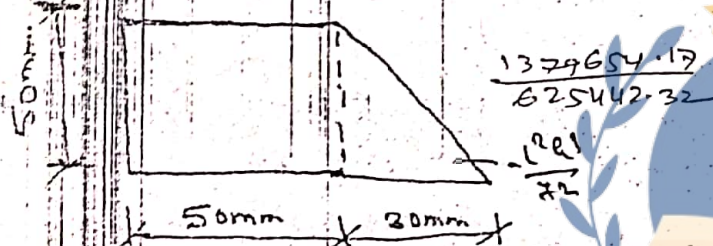
$E_{\text{steel}} = 2 \times 10^5 \text{N/mm}^2$, X-sectional area of steel = 1500mm^2

$E_{\text{brass}} = 1 \times 10^5 \text{N/mm}^2$, X-sectional area of brass = 1000mm^2

Contd. ...

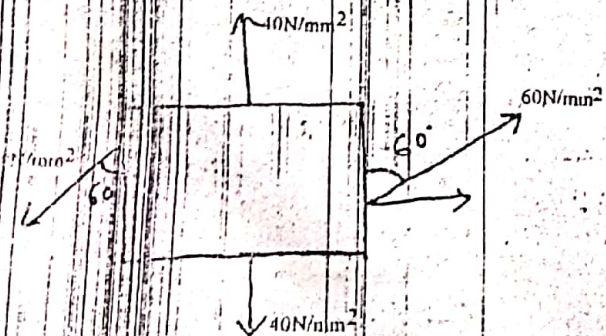


3(a) Find out principal moment of inertia of given figure.



3(b) Describe the method using Mohr's circle to determine principal moment of inertia.

4(a) A point in a strained material is subjected to stress as shown in fig. locate the principal plane and evaluate the principal stresses.



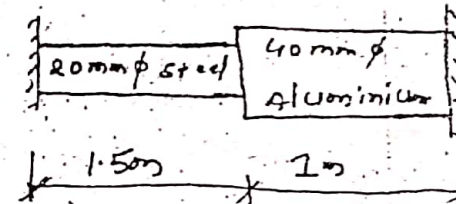
chap-5
Principle
Stress.

A composite bar made up of aluminum and steel is rigidly fixed between two supports as shown in fig. The two bars are free of

(3) stresses at 40°C . Find the stresses in two bars when temperature rises to 65°C .

Take $E_s = 2.1 \times 10^5 \text{ N/mm}^2$, $\alpha_s = 11.7 \times 10^{-6}/^{\circ}\text{C}$

$E_A = 0.7 \times 10^5 \text{ N/mm}^2$, $\alpha_A = 2.34 \times 10^{-6}/^{\circ}\text{C}$



Thermal stress & strain.

5(a) Determine the crippling load for a T-section of dimensions $10\text{cm} \times 10\text{cm} \times 2\text{cm}$ & of length 5m when it is used as strut with both of its end hinged. Take $E = 2 \times 10^5 \text{ N/mm}^2$.

(b) Find out maximum deflection of cantilever beam having point load on its free end.

6(a) A hollow shaft of external diameter 120mm transmits 300KW power at 200rpm . Determine the maximum internal diameter if the maximum stress in the shaft is not to exceed 60N/mm^2 .

(b) A square beam $20\text{mm} \times 20\text{mm}$ in section and 2.0m long is supported at the ends. The beam fails when a point load of 400N is applied at the centre of beam. What uniformly distributed load per metre length will break a cantilever of the same material 40mm wide, 60mm deep & 3m long?

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2018

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BEG201SH: Mathematics-III (New Course)

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The figures in the margin indicate full marks.

Group A

Answer FIVE questions.

5×5=25

1. Show that set of vector $s = \{x_1, x_2, x_3, x_4\}$ is linearly dependent where $x_1 = (1, 2, 4)$, $x_2 = (2, -1, 3)$, $x_3 = (0, 1, 2)$ and $x_4 = (-3, 7, 2)$.

2

Without expansion, prove that

$$\begin{vmatrix} (a+b)^2 & ca & bc \\ ca & (b+c)^2 & ab \\ bc & ab & (c+a)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

3. Solve by Gauss elimination method
- $$\begin{aligned} x + 2y - z &= 1 \\ 3x - 2y + 2z &= 2 \\ 7x - 2y + 3z &= 5 \end{aligned}$$

4. Define Hermitian and Skew-Hermitian matrices. Show that the

matrix $\begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ is Hermitian.

5. Find the eigen values and eigen vectors of the following Matrix:

$$\begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$$

6

Find the rank of the matrix

$$\begin{bmatrix} 2 & 6 & 0 \\ 6 & 20 & -6 \\ 0 & 6 & -18 \end{bmatrix}$$

Contd

(2)

Group B**Answer TWO questions.**

2×10=20

7. If $L\{f(t)\} = F(s)$, then prove that $L\{f'(t)\} = sF(s) - s^2f(0) - sf'(0) - f''(0)$.

8. Find the Laplace transform of (any TWO):

(i) $t \sinh t$ (ii) $\int_0^t \frac{\sin t}{t} dt$ (iii) $\cos(\omega t + \theta)$

9. Find the inverse Laplace transform of (any TWO):

(i) $\frac{s^2+3}{s(s^2+9)}$ (ii) $\text{Log} \frac{s+1}{s-1}$ (iii) $\frac{1}{s^3-a^3}$

10. Use convolution theorem to evaluate $L^{-1}\left\{\frac{1}{s^2(s^2+a^2)}\right\}$

11. Solve the initial value problem by Laplace transform method:

$$\frac{d^2y}{dx^2} - 3\frac{dy}{dx} + 2y = 2e^{-x}, y(0) = 2, y'(0) = -1$$

Group C**Answer FIVE questions.**

5×5=25

12. Define Line Integral and Prove that the line integral $\int_C \vec{F} \cdot d\vec{r}$ of acontinuous vector function $\vec{F}$ defined in a region R of space is independent of path joining any two points in that region iff there exist a single valued scalar function ϕ having first order partial derivatives such that $\vec{F}$ is gradient of ϕ .13. Find $\iint_S \vec{F} \cdot \vec{n} ds$, where $\vec{F} = (x+y)^2 \vec{i} - 2x \vec{j} + 2yz \vec{k}$ and S is the surface of the plane $2x+y+2z=6$ in the first octant.

14. State and prove the Green's Theorem in the plane.

15. Find the volume of surface $x^2/a^2 + y^2/b^2 + z^4/c^4 = 1$ by using Dirichlet's theorem.

Contd. ...

(3)

16. Verify Stoke's theorem for $\vec{F} = 2y \vec{i} + 3x \vec{j} - z^2 \vec{k}$ where S is upper half of the sphere $x^2 + y^2 + z^2 = 9$ and C its boundary.17. Verify Gauss-Divergence Theorem for the function $\vec{F} = y \vec{i} + x \vec{j} + z^2 \vec{k}$ over the cylindrical region bounded by $x^2 + y^2 = 9, z = 0$ and $z = 2$.**Group D****Answer TWO questions.**

2×5=10

18. Find the half-range sine series for e^x in $0 < x < 1$.19. Find the Fourier series of the function $f(x)$ defined by
$$f(x) = \begin{cases} 0 & \text{for } 0 < x < \pi \\ 0 & \text{for } \pi < x < 2\pi \end{cases}$$
20. Find the Fourier series of $f(x) = e^{-x}$ in $[-1, 1]$ in complex form.

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Group A

Answer FIVE questions.

5×5=25

1. Using properties of determinant, prove that:

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix}$$

$$= abc \left(\frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right)$$

2. Verify Cayley-Hamilton theorem for the matrix

$$\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}$$

3. Obtain rank of the matrix

$$\begin{bmatrix} 1 & 0 & -5 & 6 \\ 5 & -2 & 1 & 2 \\ 4 & -2 & -4 & 8 \\ 3 & -2 & 1 & 2 \end{bmatrix}$$

by converting it into

normal form.

4. Test for consistency and solve the following system of linear equations:

$$x + y + z = 6; x + 2y + 4z = 1; x + 2y + 3z = 10.$$

Contd. ...

(2)

5. Find the Eigen-value and the Eigen-vectors of the matrix

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 2 \\ 0 & 2 & 3 \end{bmatrix}$$

6. Represent the following transformations by matrix form and also obtain the inverse transformation: $y_1 = 3x_1 - x_2$; $y_2 = -5x_1 + 2x_2$.

Group B**Answer TWO questions.**

2×10=20

- 7(a) State and prove linearity property of Laplace transform.

- (b) Obtain the Laplace transform of (i) $t^2 \sin t$ and (ii) $e^{3t} \sin t$.

- 8(a) Calculate the inverse Laplace transform of $\frac{1}{(s^2 + 4)(s - 1)}$.

- (b) Use convolution theorem to obtain inverse Laplace transform of

$$\frac{1}{(s-2)(s-3)}$$

9. The position of a moving particle in a plane curve are given by the

equations $\frac{dy}{dt} + 2x = \sin 2t$; $\frac{dx}{dt} - 2y = \cos 2t$; $t > 0$. If $(x, y) = (1, 0)$ is

the initial position at $t = 0$, obtain the equation of the curve in which the particle is moving.

Group C**Answer FIVE questions.**

5×5=25

10. Evaluate:

$$\int_C \vec{F} \cdot d\vec{r}, \text{ where } \vec{F} = (2x - y + z)\vec{i} + (x + y - z^2)\vec{j} + (3x - 2y + 4z)\vec{k}$$

and C is the circle $x^2 + y^2 = 4$; $z = 0$.

11. Prove that $\vec{F} = (2xz^3 + 6y)\vec{i} + (6x - 2yz)\vec{j} + (3x^2z^2 - y^2)\vec{k}$ is a conservative vector field. Also find its scalar potential function.

(3)

12. Evaluate $\iint_S (4xz\vec{i} - y^2\vec{j} + yz\vec{k}) \cdot \hat{n} ds$ where S is the surface of the unit cube located in the first octant with a corner at origin.

13. State and prove Green's theorem in plane.

14. Applying Stoke's theorem, evaluate the integrals $\int_C (x + y)dx + (2x - z)dy + (y + z)dz$ where, C is the boundary of

the triangle with vertices (2, 0, 0), (0, 3, 0) and (0, 0, 6).

15. Find the volume of surface $\left(\frac{x}{a}\right)^{2/3} + \left(\frac{y}{b}\right)^{2/3} + \left(\frac{z}{c}\right)^{2/3} = 1$ using Dirichlet's theorem.

Group D**Answer TWO questions.**

2×5=

16. Obtain the Fourier sine series of x^2 in the interval $0 < x < 3$

17. Find the Fourier series of the function $f(x) = e^x$ in $[-1, 1]$ complex form.

18. Obtain the half range cosine series for $f(x) = \sin x$, $0 < x < \pi$.

PURBANCHAL UNIVERSITY

2016

B.E. (Civil, Computer/E&C/Electrical)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG201SH: Mathematics-III (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Answer FIVE questions.

5×5=25

1. Find the inverse of a matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 5 \\ 3 & 5 & 6 \end{pmatrix}$.

2. Prove that $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$.

3. Solve the following system of linear equations by Gauss elimination method: $x-2y+3z=2$, $2x-3y+z=1$, $3x-y+2z=9$.

4. Find the rank of the matrix: $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$

5. Show that $\begin{bmatrix} 3 & 7-4i & -2+5i \\ 7+4i & -2 & 3+i \\ -2-5i & 3-i & 4 \end{bmatrix}$ is Hermitian matrix.

6. Find the eigen value and eigen vector of the matrix $\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$

Contd. ...

(2)

Group B**Answer TWO questions.****2×10=20**

7(a) State and prove the existence property of laplace transform.

(b) Find the laplace transform of:

(i) $te^{-3t}\cos 2t$

(ii) e^{at+b}

8(a) Using Convolution theorem, find the inverse Laplace transform of

$$\frac{s^2}{(s^2 + a^2)^2}$$

(b) Find the inverse Laplace transform of $\frac{s^2 + s - 2}{s(s+3)(s-2)}$.9. The currents i_1 & i_2 in mesh are given by the equations

$$\frac{di_1}{dt} - \omega i_2 = a \cos pt, \quad \frac{di_2}{dt} + \omega i_1 = a \sin pt$$

Find the currents i_1 & i_2 by laplace transform if $i_1 = i_2 = 0$ at $t=0$.**Group C****Answer FIVE questions.****5×5=25**10. Define line integral and prove that the line integral $\int_C \vec{F} \cdot d\vec{r}$ of acontinuous vector function $\vec{F}$ defined in a region R is independent of path joining any two points in that region if and only if there exist a single valued scalar function ϕ having first order partial derivatives such that $\vec{F} = \nabla \phi$.11. Evaluate $\int_C \vec{F} \cdot d\vec{r}$, where $\vec{F} = z\vec{i} + x\vec{j} + y\vec{k}$ and C is the arc of the curve $\vec{r} = \cos\theta \vec{i} + \sin\theta \vec{j} + \theta\vec{k}$ from $\theta = 0$ to $\theta = 2\pi$.12. Evaluate $\iint_S \vec{F} \cdot d\vec{s}$ where $\vec{F} = (x+y^2)\vec{i} - 2x\vec{j} + 2yz\vec{k}$ and S is the surface of the plane $2x+y+2z=6$ in the first octant.

Contd. ...

(3)

13. Evaluate $\iiint_V \vec{F} \cdot d\vec{v}$ where V is the region bounded by $x=0, y=0, y=z-x^2$ and $z=4$, and $\vec{F} = x\vec{i} + y\vec{j} + z\vec{k}$.

14. State and prove the Green's theorem in the plane.

15. Evaluate $\iint_S \vec{F} \cdot \hat{n} \, ds$, where $\vec{F} = 4xz\vec{i} - y^2\vec{j} + yz\vec{k}$ and S is the surface of the cube bounded by the planes $x=0, x=1, y=0, y=1, z=0, z=1$ by using Gauss-Divergence theorem.**Group D****Answer TWO questions.****2×5=**16. Expand the function $f(x) = x \sin x$ as a Fourier series in the interval $-\pi \leq x \leq \pi$.17. Find the Fourier series for $f(x) = x - x^2$ in the interval $-1 \leq x \leq 1$.18. Explain $f(x) = x$ as a half range cosine series in $0 < x < 2$.

PURBANCHAL UNIVERSITY

2015

B.E. (Civil, Computer/E&C/Electrical)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEC201SH: Mathematics-III (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Answer FIVE questions.

5×5=25

1. Using properties, prove that

$$\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$$

2. Show that every square matrix can be uniquely expressed as the sum of a Hermitian and Skew-Hermitian matrices.

Or

Show that $(AB)^{-1} = B^{-1}A^{-1}$

3. Test the consistency and solve by Gauss Elimination Method:

$$2x - 2y + z = 1$$

$$x + 2y + 2z = 2$$

$$2x + y - 2z = 7$$

4. Find the rank of the matrix:

$$\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 4 & 6 \end{bmatrix}$$

5. Determine the eigen value and eigen vectors of the matrix:

$$\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$$

Contd. ...

(2)

6. Find the inverse of matrix by Gauss Jordan's method:

$$A = \begin{bmatrix} 4 & 1 & 2 \\ 1 & 2 & -1 \\ 3 & -1 & 1 \end{bmatrix}$$

Group B**Answer FOUR questions.**

4×5=20

7. Find the Laplace transform of the functions (any TWO):

(i) $t e^{-2t} \sin t$ (ii) $\frac{1 - \cos t}{t}$ (iii) $\cos(\omega t + \theta)$

8. Find the Inverse Laplace transform of the functions (any TWO):

(i) $\frac{2s+3}{s^2+5s-6}$ (ii) $\tan^{-1}\left(\frac{2}{s}\right)$ (iii) $\log\left(1+\frac{1}{s^2}\right)$

9. Use the Laplace transform to solve the differential equation

$$\frac{d^4 y}{dt^4} - 16y = 0; \quad y(0) = 1, y'(0) = y''(0) = y'''(0) = 0.$$

10. Find the inverse Laplace transform by convolution Method of

$$\frac{1}{s^2(s+1)^2}.$$

11. If $\mathcal{L}\{f(t)\} = F(s)$, prove that $\mathcal{L}\{f'''(t)\} = s^3 F(s) - s^2 f(0) - s f'(0) - f''(0)$.

Group C**Answer FIVE questions.**

5×5=25

12. Prove that the line integral $\int_C \vec{F} \cdot d\vec{r}$ of a continuous vector function

defined in a region R is independent of path joining any points in R if and only if there exists a single valued scalar function ϕ having first order partial derivatives such that $\vec{F} = \nabla \phi$.

13. Find the work done in moving a particle once around a circle $x^2 + y^2 = 4, z = 0$, if the force field $\vec{F}$ is defined by

$$\vec{F} = (2x - y + 2z)\vec{i} + (x + y - z)\vec{j} + (3x - 2y - 5z)\vec{k}.$$

(3)

14. Evaluate $\iint_S \vec{F} \cdot \vec{n} \, ds$ where $\vec{F} = x\vec{i} + y\vec{j} + z\vec{k}$ and S is the surface of the sphere $x^2 + y^2 + z^2 = 1$.

15. Find the volume bounded by surface $x^4/a^4 + y^4/b^4 + z^4/c^4 = 1$ by Dirichlet's theorem.

16. Use Green's theorem to find the area of the ellipse $x^2/a^2 + y^2/b^2 = 1$.

17. Evaluate $\int_C \vec{F} \cdot d\vec{r}$ by Stoke's theorem, where $\vec{F} = y^2\vec{i} + x^2\vec{j} - (x+z)\vec{k}$ and C is the boundary of the triangle with vertices $(0,0,0)$, $(1,0,0)$ and $(1,1,0)$.

Group D**Answer TWO questions.**

2×5=10

18. Obtain a Fourier series of the function $f(x) = (\pi - x)$ in the interval $[0, 2\pi]$.

19. Obtain the half-range sine series for $f(x) = e^x$ in $0 \leq x \leq 1$.

20. Find the Fourier series of $f(x) = x^2$ in -1 to 1 in the complex form.

PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG201SH: Engineering Mathematics-III

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

Answer FIVE questions.

5×5=25

1. Define Hermitian and Skew-Hermitian matrix with example and show that if A is a Hermitian then iA is a skew Hermitian matrix.

2. Prove that
$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

3. Show that the transformation which transform $y_1 = x_1 - x_2 + x_3$, $y_2 = 3x_1 - x_2 + 2x_3$, $y_3 = 2x_1 - 2x_2 + 3x_3$ is regular. Find the inverse transformation.

4. Test consistency and solve the system of equations by Gauss elimination method $x - 2y + z = 3$, $4y + 3z = 13$, $3x + 5y = 11$.

5. Find the rank of matrix $\begin{bmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 9 & -3 & 7 & 7 \end{bmatrix}$ by reducing to normal form.

6. Find the Eigen values and Eigen vectors of the matrix $\begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$.

Contd. ...

(2)

Group B**Answer FOUR questions.**

4×5=20

7. Define the Laplace transform. Show that the existence of Laplace transform if $\lim_{s \rightarrow \infty} F(s) = 0$.
8. Find the Laplace transform of any TWO:
- (a) $\int_0^t e^{-t} \cos t dt$ (b) $te^{-3t} \cos 5t$ (c) $f(t) = \begin{cases} t-1, & \text{for } 1 < t < 2 \\ 0, & \text{otherwise} \end{cases}$
9. Find the inverse transform of any TWO:
- (a) $\frac{s^3}{s^4 + a^4}$ (b) $\log\left(1 - \frac{a^2}{s^2}\right)$ (c) $\frac{1}{(s-2)(s+2)^2}$
10. Solve the simultaneous equation:
- $$\frac{dx}{dt} + 5x - 2y = t, \quad \frac{dy}{dt} + 2x + y = 0,$$
- where, $x(0)=y(0)=0$, by Laplace transform method.
11. Solve the following problem by using Laplace transform method:
- $$y'' + y = \sin 3t, y(0) = y'(0) = 0$$

Group C**Answer FIVE questions.**

5×5=25

12. Find the work done in moving a particle once around a circle $x^2 + y^2 = 4, z = 0$, if the force field $\vec{F}$ is defined $\vec{F} = (2x - y + 2z)\vec{i} + (x + y - z)\vec{j} + (3x - 2y + 5z)\vec{k}$.

Or

Evaluate the volume integral $\iiint_V \vec{F} dV$ where V is the region bounded by the surface $x=0, y=0$.

$$y = 6, z = x^2, z = 4 \text{ and } \vec{F} = 2xz\vec{i} - x\vec{j} + y^2\vec{k}$$

13. Evaluate $\iint_S \vec{F} \cdot \hat{n} ds$ where $\vec{F} = 6z\vec{i} - 4\vec{j} + y\vec{k}$ and S is the surface of the plane $2x + 3y + 6z = 12$ in the first octant.

(3)

14. State Stoke's theorem and form it deduce the result

$$\oint_C \phi d\vec{r} = \iint_S (\vec{n} \times \nabla \phi) ds.$$

15. Find the line integral $\oint_C \vec{F} \cdot d\vec{r}$ using Stoke's theorem, where

$\vec{F} = (2x - y)\vec{i} - yz^2\vec{j} - y^2z\vec{k}$ and 'C' is the circle $x^2 + y^2 = 1$, which is the projection of the sphere $x^2 + y^2 + z^2 = 1$.

16. Find the area of the ellipse $x^2/a^2 + y^2/b^2 = 1$ by Green's theorem.

17. Applying Gauss Divergence theorem prove that $\iint_S \vec{F} \cdot \hat{n} ds =$ where $\vec{F} = yz\vec{i} + zx\vec{j} + xy\vec{k}$ and S is the surface of sphere $x^2 + y^2 + z^2 = 1$ in the first octant.

Group D**Answer TWO questions.**

2×5=

18. Define even and odd function. Find the Fourier series of function $f(x) = (\pi - x)$ in the interval $[0, 2\pi]$.
19. Obtain the half range Cosine series for $f(x) = x$ in $0 < x < 2$.
20. Find the Fourier series of $f(x) = e^{-x}$ in $(-1 \text{ to } 1)$ in complex form.

PURBANCHAL UNIVERSITY

2013

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG201SH: Engineering Mathematics-III (New Course)

Candidates are required to give their answers in their own words as far as practicable.

The figures in the margin indicate full marks.

Group A

5x5=25

Answer FIVE questions.

1. If $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$, prove that $A^{-1} = A^T$.

2. If $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$ and x, y, z are unequal, prove that $xyz = -1$.

3. Using Gauss-Jordan reduction method, find the inverse of the matrix $\begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ 2 & -4 & -4 \end{bmatrix}$.

4. Solve the following system of linear equations by Gauss-elimination method:
 $x - 6y - z = 10$
 $2x - 2y + 3z = 10$
 $3x - 8y + 2z = 20$

5. Find the rank of the following matrix by reducing into canonical form $A = \begin{bmatrix} 3 & -4 & -1 & 2 \\ 1 & 7 & 3 & 1 \\ 5 & -2 & 5 & 4 \\ 9 & -3 & 7 & 7 \end{bmatrix}$.

6. Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$.

$= \begin{vmatrix} -2-\lambda & 2 & -3 \\ 2 & 1-\lambda & -6 \\ -1 & -2 & 0-\lambda \end{vmatrix} = 0$

Contd. ...

(2)

Group B

5×5=25

Answer FIVE questions.

7. Show that $\vec{F} = 2xyz^2\vec{i} + (x^2z^2 + z\cos yz)\vec{j} + (2x^2yz + y\cos yz)\vec{k}$ is conservative. Also find the scalar point function ϕ such that $\vec{F} = \nabla\phi$. Hence evaluate $\int_C \vec{F} \cdot d\vec{r}$ from $(1,0,1)$ to $(0, \frac{\pi}{2}, 1)$.
8. Find the work done in a moving particle in the force field $\vec{F} = 3x^2\vec{i} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from $(0,0,0)$ to $(2,1,3)$. Also along the curve defined by $x^2 = 4y, 3x^3 = 8z$ from $x=0$ to $x=2$.
9. State Ditchlet's theorem, obtain the volume of the sphere $x^2/a^2 + y^2/b^2 + z^2/c^2 = 1$ by using Ditchlet's theorem.
10. Using Green's theorem, evaluate $\int_C ((2x - y + 4)dx + (5y + 3x - 6)dy)$ around the circle of radius 4 with centre at origin.
11. State Stoke's theorem and hence deduce the result $\int_C \phi d\vec{r} = \iint_S ((\vec{n} \times \nabla\phi) \times \vec{F}) \cdot d\vec{s}$.
12. State Gauss divergence theorem. Apply it to evaluate the normal surface integral $\iint_S \vec{F} \cdot \vec{n} ds$, where $\vec{F} = (2x - z)\vec{i} + x^2y\vec{j} - xy^2\vec{k}$ and S is the surface of the cube bounded by $x=0, x=1, y=0, y=1, z=0, z=1$.

Group C

2×10=20

Answer TWO questions.

- 13(a) Define Laplace transform of a function. State and establish linearity property of it.

(b) Find the Laplace transform of:

(i) $\frac{1}{\sqrt{t}}$

(ii) $\sin 3t \cos 2t$

Contd. ...

(3)

14. Find the inverse Laplace transform of:

(a) $\frac{s}{s^4 + s^2 + 1}$

(b) $\frac{s}{s^2(s^2 + a^2)}$

15. Solve the following initial value problem by Laplace transform method: $y'' + y' - 2y = t$; $y(0) = 1, y'(0) = 0$.

Group D

1×10=10

Answer ONE question.

16. Expand $f(x) = x \sin x, 0 < x < 2\pi$ as Fourier series.
17. Find the Fourier sine series for $f(x) = e^{ax}$ in $(0, \pi)$.
18. Find the complex form of the Fourier series of the periodic function: $f(x) = \cos x$, in $-\pi < x < \pi$.

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Survey-I (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

1(a) What is surveying? Explain the principles of surveying with example and necessary sketches? 2+6

(b) A steel tape of nominal length 30m was used to measure a line AB by suspending it between supports. If the measured length was 29.861m when the slope angle was $3^{\circ}45'00''$, mean temperature and tension applied were respectively 10°C and 100N, determine the corrected horizontal length. The standardised length of the tape was 30.004m at 20°C and 40.5N tension. The tape to be weighted 0.16 N/m and had a cross-sectional area of 2mm^2 . $E=2 \times 10^5 \text{ N/mm}^2$ and $\alpha=1.12 \times 10^{-5}/^{\circ}\text{C}$. 8

2(a) What are the distance measurement techniques? Explain about types of error. 4+4

(b) A survey line ABC cuts the banks of a river at B and C, and to determine the distance BC, a line BE, 60m long was set out roughly parallel to the river. A point D was then found in CE produced and middle point F of DB determined. F was then produced to G, making FG equal to EF, and DG produced to cut the survey line in H. GH and HB were found to be 40 and 80 metres long respectively. Find the distance from B to C. 8

3(a) Define the following terms: 2+4

- (i) True meridian and true bearing
- (ii) Whole circle bearing and reduced bearing

(b) The following bearing were taken in running a closed traverse: 10
Contd. ...

(2)

Line	AB	BC	CD	DE	EA
FB	48°25'	177°45'	104°15'	165°15'	259°30'
BB	230°00'	256°00'	284°55'	345°15'	79°00'

- (i) State the stations which are affected by local attraction and by how much?
(ii) Determine the correct bearings.
(iii) Calculate the true bearing if the declination was $1^{\circ}30'W$.

4(a) When is reciprocal levelling done? Explain the procedure of reciprocal levelling. 2+4

(b) The following consecutive reading were taken with a level and a 4m levelling staff on a continuously sloping ground at common interval of 50m.

0.85 (on A), 1.545, 2.335, 3.115, 3.825, 0.455, 1.380, 2.055, 2.855, 3.455, 0.585, 1.0 15, 1.850, 2.855, 3.845 (on B).

The RL of A was 380.5m. Make entry in a level book and apply the usual checks. Determine gradient of AB. 10

5(a) List out the methods of plane tabling. Explain any two methods. 6

(b) A series of offsets were taken from a chain line to a curved boundary line at intervals of 15 metres in the following orders: 0, 2.65, 3.80, 3.75, 4.65, 3.60, 4.95, 5.85 metre. Compute the area between the chain line, the curved boundary and the end offsets by: (i) trapezoidal rule and (ii) Simpson's rule. 10

6. Write short notes on any FOUR: 4×4 = 16

- (a) Field work
(b) GPS and its components
(c) Magnetic Declination
(d) Horizontal and vertical angle measurement by Theodolite
(e) Curvature and refraction error in levelling

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Survey-I (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

1(a) Define surveying. Differentiate between plane surveying and geodetic surveying. 2+4

(b) A 30 m steel tape was standardized under a pull 10 kg and temperature of 20°C and found to be 30.02 m long. The cross-sectional area of tape is 3.87 mm^2 and weight is 0.916 kg. The tape was used to measure the distance of 140.25 m between A & B in 5 equal spans under the following conditions. 10

Average temperature = 25°C

Pull applied = 5 kg

Slope of the line = 1 in 50.

Young modulus of elasticity $E = 2.0 \times 10^6\text{ kg/cm}^2$

Coefficient of linear expansion of tape $\alpha = 11 \times 10^{-6}/^{\circ}\text{C}$

Find the actual distance between A & B.

2(a) Discuss about magnetic declination, its effect and its variations. 8

(b) In passing the pond stations A and D on the main line, were taken on the opposite sides of the pond; On the left of AD, a line AB, 235m long was laid down and a second line AC, 265m long was ranged on the right of AD, the points B, D, C being in the same straight line. BD and DC were then chained and found to be 120m and 135.5m respectively. If the chainage of A is 1230.50m, determine the chainage of D. 8

3(a) Discuss about different methods of direct distance measurement. 6

Contd. ...

(2)

- (b) Following are the bearings taken in a closed traverse ABCD:

Line	Fore Bearing	Back Bearing
AB	74°20'	256°00'
BC	107°20'	286°20'
CD	224°50'	44°50'
DA	306°40'	126°00'

Local attraction exists at some of the traverse stations. Detect the stations with local attractions and compute the correct bearings. If the magnetic declination at the place is 3°30' E, what will be the true bearings? 10

- 4(a) Discuss about longitudinal and cross-section levelling. 6

- (b) A surveyor was asked to take the levels on a continuously sloping ground for constructing a road with a staff of length 4m. The following staff readings were taken with the level at regular interval of 30m. The RL of the first point was 98.62m. 10

You are required to rule out a page of level book and enter the following readings with the usual checks.

1.50, 1.94, 2.52, 3.31, 3.90, 1.40, 2.50, 3.60, 3.70, 3.90, 1.50, 2.60.

- 5(a) List down the principle axes of a theodolite. Explain the procedure of measuring bearing using the theodolite. 2+6

- (b) What is Plane table surveying? Explain various methods of plane tabling. 2+6

6. Write short notes on any FOUR: 4×4 = 16

- (a) GPS and its application
- (b) Offsets
- (c) Reciprocal Ranging
- (d) Barometric levelling
- (e) Volume measurement by Trapezoidal and Prismoidal method.

PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Third Semester/ Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Survey-I (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

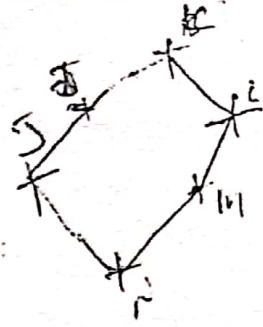
- 1(a) Surveying is the first step of any engineering works, justify the statement. Mention the classification of surveying. 4+4
- (b) A steel tape 30m long, standardized at 27°C temperature with a pull of 14 kg was used to measure distance along a slope of 5°45'. If the mean temperature during measurement in the field was 36°C and the pull applied 18 kg, determine the correction required per tape length. Assume cross sectional area of the tape is 0.065cm², Young's modulus of elasticity is 2.1×10⁶ kg/cm², coefficient of thermal expansion of tape material is 11.2×10⁻⁶ per °C. 8
- 2(a) Illustrate the different methods of measuring distance on sloping ground with showing necessary sketches. 8
- (b) A pond obstructs the chain line AB. A line AC was measured on the left of the line AB for circumventing the obstacle whose length was 905m. Similarly, another line AD was measured on the right of the line AB whose length was 1107m. Points C, B and D are on the same straight line. Length of line BC and BD are 509m and 547m respectively. Find the distance AB. 8
- 3(a) What do you mean by closing error in compass traversing? Describe the adjustment of the closing error briefly with necessary sketches. 2+4
- (b) The following are observations were taken with a prismatic compass in a closed traverse:

Contd. ...

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(2)

Line	FB	BB
JK	51° 50'	230° 10'
KL	175° 30'	356° 20'
LM	204° 25'	24° 45'
MN	265° 30'	85° 30'
NJ	351° 40'	171° 15'



Determine the amount of local attraction at different stations, if any? Calculate the angles and correct bearings of the lines. Also find the true bearing of the lines if the magnetic declination is 3°40' west. 10

- 4(a) Mention the principle of leveling with sketches. Illustrate the uses of leveling. 2+4

- (b) The following observation is recorded during a fly leveling:

B.S.=0.62, 2.09, 1.46, 2.69 and 2.45m

F.S.=2.43, 1.37, 0.58 and 2.47m

The first B.S. was taken on a B.M. of RL 450.000m. From the last B.S., it is required to set 5 pegs each at a distance of 25m on a rising gradient of 1 in 250. Enter these observations in a form of level book and calculate the RLs of the top of each peg. Also determine the staff readings on each peg and apply the usual checks. 10

- 5(a) Explain the field procedure of measuring horizontal angle by repetition method using optical theodolite briefly giving example. 6

- (b) Illustrate the intersection method of plane table surveying with necessary sketches. 4

- (c) The following offsets were taken from a chain line to an irregular boundary:

Distance (m):	0	5	10	15	20	30	40	50	60	75	90
Offset (m):	3.4	3.0	2.8	1.9	1.6	1.4	2.3	2.5	3.1	3.7	4.2

Calculate the area enclosed between the chain line, irregular boundary and the end offsets by Simpson's Rule. 6

6. Write short notes on any FOUR:

4×4=16

- Method of volume measurement using Trapezoidal and Prismoidal for formula
- Temporary adjustment of level
- Introduction to GPS and its components
- Obstacle in chaining but not ranging
- Magnetic Declination

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PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Third Semester/ Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Survey-I (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

1(a) ✓ What is surveying? Explain the principle of surveying with examples and necessary sketches. 2+6

(b) ✓ A steel tape 20m long, standardized at 15°C temperature with a pull of 10 kg was used to measure distance along a slope of 4°25'. If the mean temperature during measurement was 10°C and the pull applied 16 kg, determine the correction required per tape length. Assume cross sectional area of the tape is 0.08 cm², Young's modulus of elasticity is 2.1×10^6 kg/cm², coefficient of thermal expansion (α) = 11.2×10^{-6} per°C. 8

2(a) ✓ What are the advantage and disadvantage of plane tabling? 8

(b) ✓ A chain line ABC was laid across a river to determine the width of it, the points B and C being on two sides of the river. From point D 60 m from B on line BD which was at right angle to AB, the bearings of points C and A were found to be 280° and 190° respectively. If the distance AB was 32 m, determine the width BC of the river. 8

3(a) ✓ Define bearing of a survey line. Describe designation of bearings with sketches. 6

(b) ✓ The following are the bearings observed in traversing with a compass

Line	FB	BB
AB	59° 00' 00"	239° 00' 00"
BC	139° 30' 00"	317° 00' 00"
CD	215° 15' 00"	36° 30' 00"
DE	208° 00' 00"	29° 00' 00"
EA	318° 30' 00"	138° 45' 00"

Contd. ...

(2)

Find the amount of local attraction at different stations where it would be suspected? Also find the corrected bearing of the lines? If the magnetic declination is 5°E , determine the true bearings. 10

✓ 4(a) What is the principle of leveling? Describe the temporary adjustment of level. 6

✓ (b) The following consecutive readings were taken with a level and 4 m leveling staff on a continuously sloping ground at common interval of 25 m.

0.905 (on A), 1.745, 2.345, 3.125, 3.725, 0.545, 1.390, 2.055, 2.955, 3.455, 0.595, 1.015, 1.850, 2.655 and 2.945 m (on B).

The RL of A was 540.000 m. Prepare a level book and calculate the RLs of different points. Also determine the gradient of the line AB and apply the usual check. 10

5(a) Explain the field procedure to measure the horizontal angle by repetition method using theodolite? Explain with an example and necessary sketch. 6

(b) Explain the Trapezoidal Rule and Simpson's Rule for computing area in brief. 6

(c) An excavation is to be made for a reservoir 45 m long and 25 m wide at the bottom. The side slope of the excavation has to be 2:1. Calculate the volume of earthwork if the depth of excavation is 6 m. Assume level ground at the site. 4

6. Write short notes (any FOUR): 4×4 =16

✓ (a) Field book

✓ (b) Magnetic declination

✓ (c) Global positioning system (GPS) and its components

✓ (d) Technique of distance measurement

(e) Two peg test



PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Surveying-I

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

1(a) Describe in brief the principles of surveying. 6

(b) A nominal distance of 30m was set out with a steel tape from a mark on the top of one peg to the mark on the another peg, the tape being in catenary under a pull of 220N and at a mean temperature of 17°C. The top of one peg was 0.68m below the top of the other. Determine the horizontal distance between the marks. The tape was standardized in catenary under a pull of 178N and at temperature of 20°C, had mass of 0.026kg/m and cross sectional area of 3.25mm². Take $\alpha = 1.13 \times 10^{-6}/^{\circ}\text{C}$ and $E = 2.1 \times 10^6 \text{ Kg/cm}^2$. 10

2(a) Define fore sight, back sight and turning point. Explain about the temporary adjustment of level. 3+5

(b) A chain line ABC crosses a river at right angle cuts its banks at B & C. To determine the width BC of the river, the following operation was carried out. A point E was established on the perpendicular BE such that angle CEF is right angle where F is a point on the survey line. If the chainage of F & B are respectively 1200m & 1320m and the distance EB is 90m, calculate the width of river & also the chainage of C. 8

3(a) Define ranging & explain about reciprocal ranging with necessary sketches. 1+5

(b) Following are the bearings taken in a closed traverse:

Contd. ...

(2)

Side	F.B	B.B
AB	75°05'	254°20'
BC	115°20'	296°35'
CD	165°35'	345°45'
DE	224°50'	44°05'
EA	304°50'	125°05'

At what stations do you suspect the local attraction? Determine the correct bearings of all the lines. 10

4(a) Differentiate between Prismatic and Surveyors compass. 6

(b) The following readings were taken with a level and 4m leveling staff on a continuously sloping ground at 30m interval.

0.680, 1.455, 1.855, 2.330, 2.885, 3.380, 1.055, 1.860, 2.265, 3.540, 0.835, 0.945, 1.530 & 2.250m.

Rule out the page of level book & enter the above readings. Carry out the necessary check and also find the gradient between the first & last point. 10

5(a) List out the methods of Plane tabling. Explain any two methods. 6

(b) A road embankment of 30m wide at the top with side slope of 2:1. The ground levels at 100m intervals along line PQ are as under:

P 153.0, 151.8, 151.2, 150.6, 149.2Q.

The formation level at P is 161.4m with falling gradient of 1 in 50 from P to Q. Calculate by prismoidal formula the volume of earth work in cubic meters, assuming the ground to be level in cross section. 10

6. Write short notes (any FOUR): $4 \times 4 = 16$

(a) Criteria to be considered in selecting stations in chain survey

(b) Designation of bearing

(c) Fundamental lines of theodolite & their relation

(d) Curvature & Refraction error in leveling

(e) Components of GPS

PURBANCHAL UNIVERSITY

2013 (New)

B.E. (Civil)/Third Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Surveying-I

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary.

- (a) How does a map differ from a plan? Differentiate between Plane and Geodetic Surveying. 2+4
- (b) A steel tape was exactly 30m long at 20°C when supported throughout its length under a pull of 10kg. A line was measured with this tape under a pull of 15 kg and at a mean temperature of 32°C and found to be 780m long. The cross-sectional area of the tape=0.03 cm², and its total weight=0.693 kg. Coefficient of expansion $\alpha=11 \times 10^{-6}$ per °C and Modulus of Elasticity $E=2.1 \times 10^6$ kg/sq.cm. Compute the true length of the line if the tape was supported during measurement: (i) at every 15m, (ii) at every 10m. 10
- a) Define error and discrepancy. List the sources and types of errors in surveying. Discuss briefly with suitable examples. 8
- b) What are the different obstacles faced in chaining? How would you measure distance between two points A and B if they lie at:
 - (i) Opposite ends of a building?
 - (ii) Opposite ends of a large pond?
 8
- c) What is the principle of Chain Surveying? What are the points that must be considered while choosing stations for Chain Surveying? 3+3
- d) What is local attraction? How can we find if local attraction exists at a station? The observed values of bearings are given in the table below. Adjust the bearing for local attraction. 2+8

Line	FB	BB
AB	191° 45'	13° 0'
BC	39° 30'	222° 30'
CD	22° 15'	200° 30'
DE	242° 45'	62° 45'
EA	330° 15'	147° 45'

Contd. ...

PURBANCHAL UNIVERSITY

2012

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG258CI: Surveying-II

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions. Assume any data if necessary. 5×16=80

- 1(a) Write down the history and development of surveying? Surveying is the most important tool for the Civil Engineers, Justify? 4+4
- (b) A 25m steel tape was standardized at a temperature of 22°C and under a pull of 8 kg. The tape was used in catenary at a temperature of 35°C and under a pull of 15 kg. The cross sectional area of the tape is 0.025 CM², its weight per unit length is 20 g/m, Young's modulus of elasticity is 2×10^6 kg/CM², $\alpha = 11 \times 10^{-6}$ per °C. Find the total correction per tape length. 8
- 2(a) What are the different methods of plane tabling, explain any two briefly with sketches? 8
- (b) A survey line PQ intersects a building. To overcome the obstacle a perpendicular QR, 85 m long, is set out at Q. From R, two lines RS and RT are set out at angles 50° and 65° respectively with RQ. Find the lengths RS and RT such that points S and T fall on the prolongation of PQ. Also find the obstructed distance QS? 8
- 3(a) What are the different methods of levelling? Explain briefly with sketches if necessary. 8
- (b) The following readings were successively taken with a level: 0.355, 0.485, 0.625, 1.755, 1.895, 2.350, 1.780, 0.345, 0.685, 1.230 and 2.150 m
The instrument was shifted after the 4th and 7th readings. Prepare a level book and calculate the RLs of different points. The RL of the 1st point is 465.500m. 8

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(2)

- 4(a) Define closing error in compass traversing? How can you adjust the closing error in compass traversing graphically? 8
- (b) The following bearings were observed while traversing an area with a compass.

Line	FB	BB
AB	S 37° 30' 00" E	N 37° 30' 00" W
BC	S 43° 15' 00" W	N 44° 15' 00" E
CD	N 73° 00' 00" W	S 72° 15' 00" E
DE	N 12° 45' 00" E	S 13° 15' 00" W
EA	N 60° 00' 00" E	S 59° 15' 00" W

At which of these stations would local attraction be suspected? Find the corrected bearing of the lines? 8

- 5(a) What are the fundamental lines of a transit theodolite? Elaborate the relationship of these lines between them with necessary sketches. 1+5

- (b) Explain the Trapezoidal formula and Prismoidal formula for computing volume in brief? 6

- (c) The following offsets were taken from a chain line to an irregular boundary line at an interval of 10 m:

0, 2.50, 3.50, 5.00, 4.60, 3.20, 0 m.

Compute the area between the chain line, the irregular boundary line and the end offsets using Simpson's Rule. 4

6. Write short notes on any FOUR: 4×4=16

- Offset in chain surveying
- Significant figures and Rounding off numbers
- Global positioning ground by stepping method
- Chaining on sloping ground by stepping method
- Distinguish between Height of Instrument and Rise & Fall method

(2)

- 4(a) Define true bearing, magnetic bearing and magnetic declination. Compute the following missing data in the table. Show calculations. 3+

Magnetic Declination	True Bearing	Magnetic Bearing
4°E	45° 15'	49° 15'
4°W	66° 15'	60° 45'
	70° 15'	72° 15'

- (b) What is the main principle of fly Levelling? In what case do we apply the technique of Reciprocal Levelling? How Reciprocal Levelling does removes error due to curvature, refraction and collimation error? 2+

- 5(a) A two peg test was performed in order to determine the collimation error of a level instrument. First the level was kept a mid-way between stations A and B 100 m apart, the staff reading on A was 1.90 and on B was 1.40m. Then the level was set 10m behind B. The staff reading obtained for A was 1.35 and staff reading on B was 1.10m. Was the instrument in adjustment? What should be the staff reading on B when the line of sight is truly horizontal? 2+

- (b) What are the methods used on plane table survey? Which method is suitable when distance from the station to the detail to be located cannot be measured? Explain with suitable figure. 2+

- (c) Explain the desired relationship between the fundamental lines of a transit theodolite. 2+

- 6(a) Area to be measured are not always in perfect mathematical shape such as rectangle or triangle but may be irregular or curved in shape. How do we measure area of such irregular or curved features? For determining the area between a chain line and an irregular boundary, following offsets were taken.

Distance	0	5	10	15	20	25	30	35	40
Offset	0	2.5	5.0	7.5	8.8	7.5	6.5	3.5	0

Compute the area using: (i) Trapezoidal Rule, (ii) Simpson's Rule. All measurements are in meter. 2+

- (b) List the components of GPS? What are the functions of these individual components? 2+

Maddy

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG261CI: Fluid Mechanics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) Explain the reason of difference between variation in viscosity of liquid and gas due to temperature change. A plate 0.025 mm distant from a fixed plane, moves at 60 cm/s and requires a force of 2 N/m² to maintain the speed. Determine the fluid viscosity between the plates. 2+6
- (b) Define vapor pressure and cavitation. A U-tube is made up of two capillaries of diameter 1 mm and 2mm respectively. The tube is held vertically and is partially filled with liquid of surface tension 0.05 N/m and zero contact angle. Calculate the mass density of the liquid if the estimated difference in the level of the two menisci is 1.25cm. 2+6
- 2(a) Derive expressions for the total pressure force and the centre of pressure on an inclined submerged plane surface. 6
- (b) Describe in detail the conditions of equilibrium stability for submerged and floating bodies. An open rectangular tank of length 5m, width 1.5m and depth 1m is completely filled with water when at rest. Determine the volume of water remained in the tank after the tank has acquired a linear uniform horizontal acceleration of 0.6 m/s². 5+5
- 3(a) Describe different types of flow. In a three-dimensional incompressible flow, the velocity components in y and z-directions are $v=ax^3-by^2+cz^2$ $w=bx^2-cy^2+dz^2$. Determine the missing component of velocity distribution such that continuity equation is satisfied. 4+4

Contd. ...

(2)

- (b) Establish a general continuity equation for a three-dimensional fluid flow in Cartesian co-ordinate. 8

4(a) A venturimeter is provided in a vertical pipeline carrying oil of specific gravity 0.9, the flow being upwards. The difference in elevation of the throat section (15 cm dia.) and inlet section (30 cm dia.) of the venturimeter is 30 cm. The differential U-tube manometer shows a difference in level of mercury as a manometric fluid of 25 cm. Calculate the discharge of oil and pressure difference between throat and inlet sections. C_d for the venturimeter = 0.97. 8

- (b) A closed tank $1\text{m} \times 1.25\text{m}$ in plan and 4.5m in height weighs 1175 N is filled with water to a depth of 3m. A hole in one end of the side walls has an effective area of 7.5cm^2 and is located at 20cm above the tank bottom. If the coefficient of friction between the ground and the wheels is 0.012, determine the air pressure in the tank that is required to set it into motion. 8

- 5(a) A lawn sprinkler with two nozzles of diameter 4mm each is connected across a tap of water as shown in figure. The rate of flow through tap is $120\text{ cm}^3/\text{s}$. Calculate torque required to hold the rotating arm stationary. Also calculate the constant speed of rotation of the arm if free to rotate. 8



- (b) Describe the concept of boundary layer and illustrate with reference to flow over a flat plate. Define displacement thickness and derive expression to determine it. 2+3+1+2

6. Write short notes on: 4×4=16

- (a) Orifice meter
- (b) Use of Pascal law
- (c) Metacentric height
- (d) Manometer



PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG261CI: Fluid Mechanics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) What is the significance of idealizing a real fluid? 2
- (b) Derive an expression to find pressure intensity inside the soap bubble. 4
- (c) Explain the cause of viscosity of liquid and gas. 2
- (d) In the figure shown below, the pressure of air in tank 'A' is -23 mm of mercury. Determine the elevation of 'h' of the gauge liquid at A. The liquid in the tube has relative density in 1.60. 8

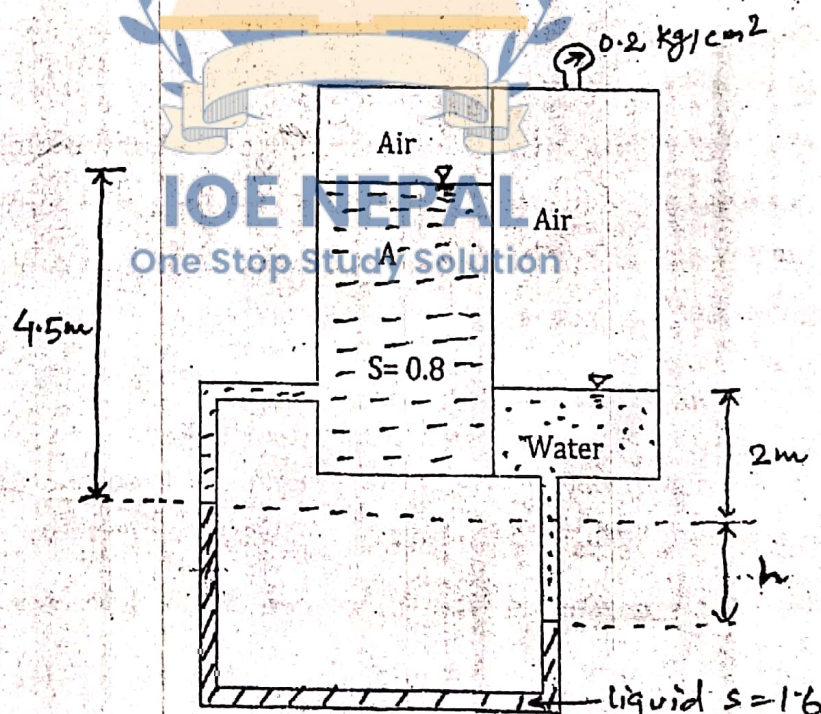


Fig. 1(d)

Contd. ...

(2)

- 2(a) State Pascal's law? Derive the expression for pressure force and center of pressure on inclined plane surface submerged in water. 2+6
- (b) Prove that the height of rise of liquid level at the wall of the container will be equal to the fall of liquid level at the centre of the cylinder subjected to constant rotation. 4
- (c) A vertical rectangular plane surface within the tank containing water is 3m wide and 5m deep. Determine the total pressure and the location of centre of pressure on the plane surface when its upper edge is horizontal and
- (i) Coincides with water surface
 - (ii) 3m below the free water surface
- 3(a) Define the buoyant force and centre of buoyancy. Explain the conditions that should be fulfilled of different three types of equilibrium for floating body. 2+6
- (b) Derive the continuity equation in three-dimensional Cartesian coordinates. Prove that one-dimensional flow can genuinely occur only in a straight duct of constant cross-sectional area. 6+2
- 4(a) Determine the third component of velocity such that they satisfy the continuity equation. The first two components are given as,
- $$U = x^3 + y^2 + z^2$$
- $$V = x^2y - yz + xy$$
- X (b) Draw neat sketch and show the laminar zone, turbulent zone as well as laminar sub layer in boundary layer theory. 4
- (c) Derive expressions for displacement thickness and energy thickness. 1 6
- 5(a) Derive the Euler equation of motion along a stream line and hence derive the Bernoulli's equation. 6 8

(3)

- (b) Derive an expression for the time required to empty completely filled hemispherical tank.
- (c) A 40cm diameter pipe conveys water at a velocity 3m/s at point A, the pressure intensity is 380KN/m² and elevation of point A is 35m from the given datum. At point B, which is 40m above the datum, the pressure intensity is 300KN/m², find the head loss between two points and also find the direction of flow.
6. Write short notes on any FOUR: 4x4=16
- ✓ (a) Newton's law of velocity
 - ✓ (b) Hydraulic co-efficients
 - ✓ (c) Classification of fluid flow
 - (d) Angular momentum principle
 - ✓ (e) Differential type of manometer

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PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG261CI: Fluid Mechanics (New Course)

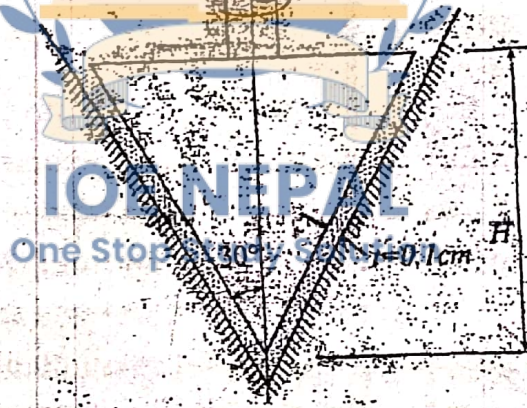
Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Briefly describe application of fluid mechanics in civil engineering. 4

(b) A conical thrust bearing idealized as cone of semi-angle 45° , maximum cone diameter 25cm rests and revolves over a uniform fluid layer of thickness 0.1cm at 500 rpm. Obtain an expression for the torque required to rotate the cone at constant speed ω . 6



(c) Prove with the help of hydrostatic law, that the pressure will be constant everywhere over the same level surface in continuous body of static fluid. 6

2(a) A square plate $4\text{m} \times 4\text{m}$ hangs vertically in water from one of its corners and its centroid lies at the depth of 8m from the free water surface. Determine the total pressure force on the plate and locate the position of centre of pressure with respect to the plate centroid. 8

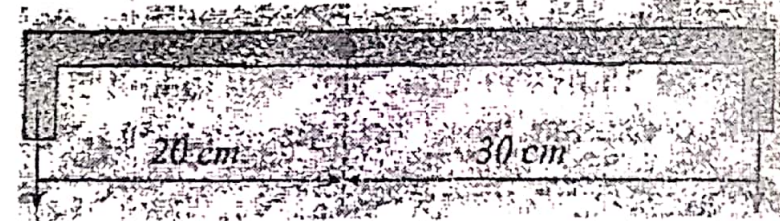
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(2)

- (b) An open cubical tank with each side 1.5m contains oil of specific weight 8.0 kN/m^3 upto a depth of 1.2m. Find the force acting on side of the tank when it is being moved with an acceleration of $g/3 \text{ m/s}^2$ in vertically upward and downward directions. What would be the pressure at the bottom of the tank when the acceleration rate is gm/s^2 vertically downward? 8
- 3(a) Explain Lagrangian and Eulerian methods of describing fluid flow. 4
- (b) Determine the third component of velocity such that they satisfy the continuity equation. The first two components are given as:
 $U = x^2 + y^2 + z^2$
 $V = xy^2 - yz^2 + xy$ 4
- (c) Establish a continuity equation in three dimensions for steady-incompressible flow. 8
- 4(a) Mention various forces acting on fluid. Derive Euler's equation of motion. 2+6
- (b) Petrol of specific gravity 0.8 is flowing through a pipe inclined at 45° to the horizontal in upward direction. A venturimeter is fitted in the 25cm diameter pipe; the ratio of areas of main and throat is 4 and throat is at a distance of 1.2m from inlet along its length. The U-tube differential manometer connected to the inlet and throat shows a steady reading of 5cm of mercury. Find the discharge and also the pressure difference between the main and the throat. The coefficient of discharge of the venturimeter is 0.95. 8
- 5(a) A lawn sprinkler with two nozzles of diameter 5mm each is connected across a tap of water as shown in figure. The rate of flow through tap is $150 \text{ cm}^3/\text{s}$. Calculate torque required to hold the rotating arm stationary. Also calculate the constant speed of rotation of the arm if free to rotate. 8

Contd. ...

(3)



- (b) A pipe of 300mm diameter conveying $0.30 \text{ m}^3/\text{s}$ of water has 135° bend in a horizontal plane. Find the resultant force exerted on the bend if the pressure at inlet and outlet of the bend are 245kPa and 235kPa.

Write short notes on any FOUR:

4×4=1

- (a) Boundary layer thickness, Momentum thickness and displacement
- (b) Streamlines and stream tube
- (c) Vapour pressure and cavitations
- (d) Pitot tube
- (e) Orifice and mouthpiece

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

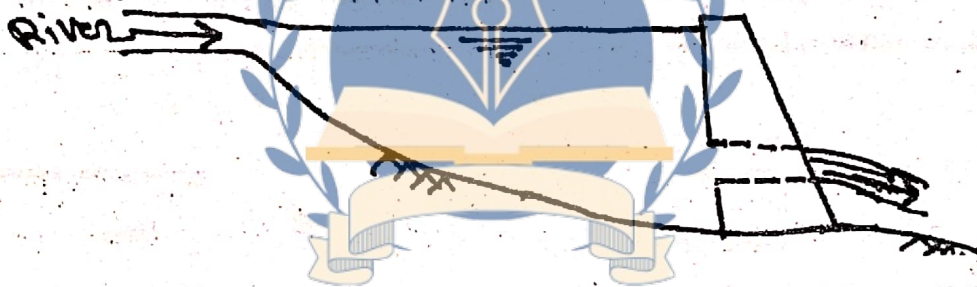
BEG261CI: Fluid Mechanics (New Course)

Candidates are required to give their answers in their own words as far as practicable.

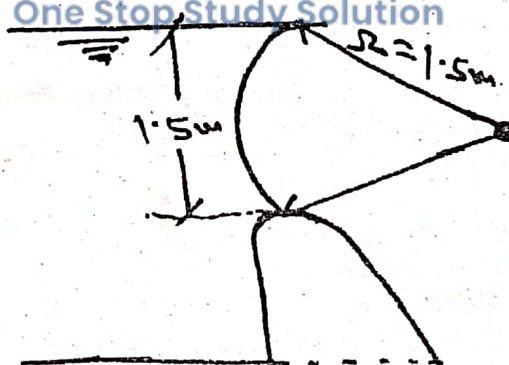
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- (a) The river discharges into the pond as below at a rate of 11 cumecs, and the out flow rate from the pond through the flow passages in the weir is 7 cumecs. If the pond surface area is 5km^2 , what is the rate of water in the reservoir? 8



- (b) Determine the hydrostatic force acting on the radial gate if the gate is 1.2m long. 8



Contd. ...

(2)

2(a) A piston weighs 5 kg. In its initial position, the platon is restrained from moving to the bottom of the cylinder by means of the metal stop. Assuming there is neither friction nor leakage between piston and cylinder, what volume of oil ($\rho_{oil} = 0.85$) would have to be added to the 2.5cm tube to cause the platon to rise 2.5cm from its initial position? 6

(b) Describe use of boundary layer theory in civil engineering with neat sketch as necessary. 5

(c) Distinguish between fluid characteristics and flow characteristics. 5

3(a) A block of wood 30cm square in cross section and 60cm long weighs 318 N. Will the block float with sides vertical? 6

(b) Derive necessary expression for pressure at the center of pipe connected with single column sensitive manometer. 6

(c) Describe fluid flow patterns. 4

4(a) Derive Bernoulli's equation using first principle of Euler's equation of motion. 8

(b) Describe venturimeter with neat sketch. 8

5(a) Derive an expression of time of emptying and discharge for hemispherical tank with orifice at bottom. 8

(b) Derive an expression of pressure variation in horizontal plane for liquid mass being rotated at constant speed with axis vertical. 8

6. Write short notes on: 4×4=16

(a) Flow Classification

(b) Mouthpiece

(c) Control volume and control surface

(d) Surface tension

PURBANCHAL UNIVERSITY

2014 (NEW)

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

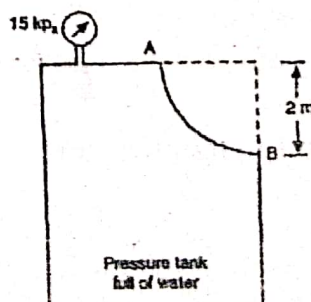
BEG261CI: Fluid Mechanics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) Explain Lagrangian and Eulerian approach of describing fluid flow. 5
- (b) Explain vapour pressure and its relation to cavitation. 5
- (c) A cylinder of 120 mm diameter rotates concentrically inside a fixed cylinder of diameter 121 mm. Both cylinders are 300 mm long. Find the viscosity of the liquid that fills the space between the cylinders if a torque of 0.90 Nm is required to maintain a speed of 60 rpm. 6
- 2(a) Prove from basic that the rate of increase of pressure in a vertical direction is equal to specific weight of the fluid. Also verify that, for a continuous static fluid, pressure intensity at any point in a horizontal plane is equal. 5+3
- (b) A tank is filled with water under pressure and the pressure gauge fitted at the top indicates a pressure of 15 kPa. A tank measures 2.5 m perpendicular to the plane of the paper, and the curved surface AB of the top is the quarter of a circular cylinder of radius 2 m. Determine (a) horizontal and vertical components of fluid pressure on the curved surface AB, and (b) magnitude and direction of the resultant force. 8



Contd. ...

(2)

3(a) Prove from basic that a vertical cylinder containing liquid is rotated with constant speed holds Bernoulli's equation good. 8

(b) Derive continuity equation from basic principle for 1-D steady-incompressible flow. 8

4(a) Mention various forces acting on fluid.

A horizontal venturimeter with the main pipe diameter of 50mm and 30mm throat is used for measuring the flow of oil of specific gravity 0.6. The difference of mercury levels shown in U-tube manometer arrangement is 12 cm. It took 5 minutes for 900 kg of oil to be collected in the tank. Calculate the coefficient of discharge for this particular device. 2+6

(b) Describe use with critical examples of boundary layer theory in pressurized and open-channel fluid flow. 4

(c) What do you understand by fluid in continuum. Explain in your own words. 4

5(a) Derive a general expression to calculate the time required for a head over the orifice at the bottom in a hemispherical tank to fall from one level to another. If the tank was full initially and is to be completely emptied, what will the expression for the time required? 6+2

(b) A pipe 180 mm in diameter conveying water at $0.15 \text{ m}^3/\text{s}$ bends by 180° in a horizontal plane. The pressure intensities at the inlet and the outlet of the bend are 200 kPa and 195 kPa respectively. Determine the force exerted by water on the bend 8

6. Write short notes on any FOUR: $4 \times 4 = 16$

(a) Meta center

(b) Gauge equation

(c) Local and convective acceleration

(d) Mouth piece

(e) Smooth and Rough boundary

≡

PURBANCHAL UNIVERSITY

2013 (New)

B.E. (Civil)/Third Semester/Chance

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG261CI: Fluid Mechanics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

- 1(a) State Newton's Law of Viscosity and derives it. What are Real and ideal fluids. 8
- (b) Calculate the dynamic viscosity of the oil, which is used for lubrication between a square plane of size 0.90m×0.90m and an inclined plane with an angle of inclination 30 degree. The weight of the plate is 300N and it slides down the inclined plane with a uniform velocity of 0.30m/sec. Take the thickness of oil film as 2mm. 8
- 2(a) State and prove the Hydrostatic of pressure variation. 8
- (b) Determine the magnitude and direction of the resultant force acting on the radial gate as shown in the Fig. 2(b) below if its length is 4m and radius also 4m. 8

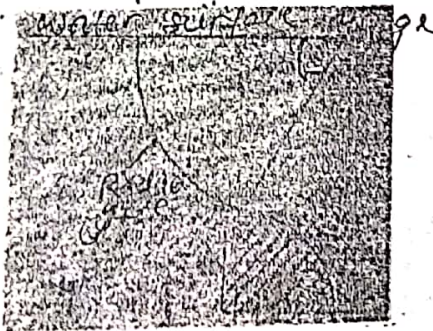


Fig. 2(b)

- 3(a) In a submerged body the CP is below the CG. Is it the correct statement? Explain based on expressions. Derive the continuity equation in Cartesian Coordinates for two dimensional flows. 4+6

Contd. ...

PURBANCHAL UNIVERSITY

2012

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG261CI: Fluid Mechanics

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

- 1(a) Explain Continuum and Surface Tension. Prove that surface tension on soap bubble is $P = 8\sigma/d$. 8
- (b) Eight Km below the surface of the ocean, the pressure is 81.7MPa. Calculate the density of seawater at this depth, If density at the surface is 1025 kg/m³ and average bulk modulus of electricity is 2.344GPa. 8
- 2(a) Explain and prove hydrostatic law. 8
- (b) A closed tank contains 0.5m of Hg, 2m of water, 3m of oil of density 600kg/m³ and there is an air space above the oil. If the gauge pressure at the bottom of the tank is 200KN/m², Calculate the pressure of air at the top of the tank. 8
- 3(a) Explain about one, two and three dimensional flow. Define Lagrangian and Eulerian approaches for describing the fluid flow. 8
- (b) The velocity vector in a flow is given by $V = 4x^3i - 10x^2yj + 2tk$. Find the velocity and acceleration of a fluid particle at (2,1,3) at time t=1 unit. 8
- 4(a) What is boundary layer theory? Define displacement thickness, momentum thickness and energy thickness with necessary equations. 8
- (b) A pipe 300m long has a slope of 1 in 100 and tapers from 1.25m diameter at high end to 0.625m diameter at the low end. Find the pressure at low end if the flow rate is 100lps and pressure at higher end is 1×10^4 kgf/m². Neglect friction. 8

Contd. ...

250X10

(2)

(a) Explain about venturimeter. Derive an expression for the discharge through a Venturimeter. 8

(b) 250 lit/Sec of water is flowing in a pipe having a diameter of 300mm. If the pipe is bent by 135° , Find the magnitude and direction of the resultant force on the bend. The pressure of the water flowing is 400 KN/m^2 . Take specific weight of water as 9.81 KN/m^3 . 8

6. Write short notes on any FOUR: 4x4=16

(a) Metacenter and Metacentric Height

(b) Vapor Pressure and cavitation

(c) Principle of Buoyancy

(d) Concept of angular momentum.

(e) Orifice meter and Pitot tube.



(2)

(b) Find the Maximum speed of an open circular cylinder having 0.18m diameter and 1.2m length and containing water up to a height of 0.96 m, at which it should be rotated about its vertical axis so that no water spills. 8

4(a) What are Navier Stoke's and Euler's equations of motion? Derive the Bernouli's equation from the Euler's equation. 3+

(b) A pipe 200m long slopes down at 1 in 100 and tapers from 600mm diameter at the higher end to 300mm diameter at the lower end and carries 100 lps of oil of (S.G. 0.8). If the pressure gauge at the higher end is 60 KN/m^2 . Neglecting all losses determine: (i) Velocities at the two ends, (ii) Pressure at the lower end. 4+

5(a) What is boundary layer? List its characteristics. Differentiate between Venturimeter and Orificemeter. 5+

(b) A lawn sprinkler shown in the Fig. 5(b) below has 12mm diameter nozzle at the end of a rotating arm and discharge water with a velocity of 15m/sec. Determine the torque required to hold the rotating arm stationary.

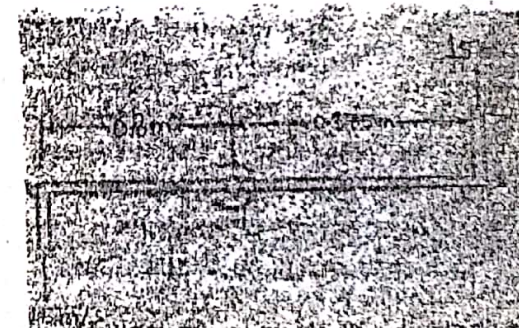


Fig. 5

6. Write short notes on any FOUR: 4x4=

(a) Stream Lines and Path Lines

(b) Laminar and Turbulent flow

(c) Hydraulics coefficients

(d) Equilibrium of Floating Bodies

(e) Langrangian and Eulerian approaches

PURBANCHAL UNIVERSITY
2018

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG226EL: Electric Circuit & Machines (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) What are the forms of energy available in nature? Describe a hydropower station with neat sketch. 5
- (b) State and explain Faraday's law of electromagnetic induction. 5
- (c) Find the resistance between points A and B of the circuit shown in Fig. 1(c). Use star-delta transformation. 6

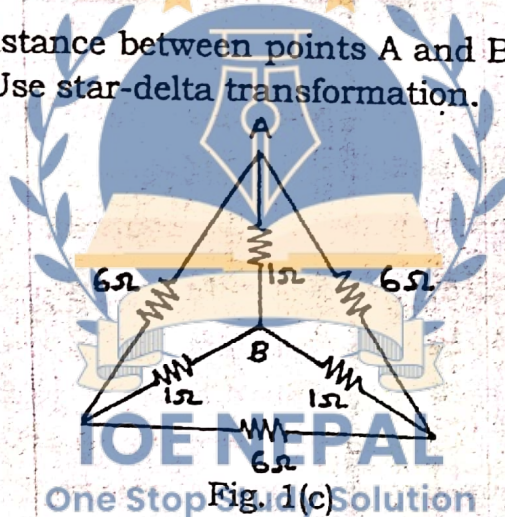


Fig. 1(c)

- 2(a) Define temperature coefficient of resistance. Derive the expression that relates α_t and α_0 where symbols have usual meaning. 1+4
- (b) Calculate the current through 4Ω resistor between points A and B of Fig. 2(b) using nodal analysis. 5

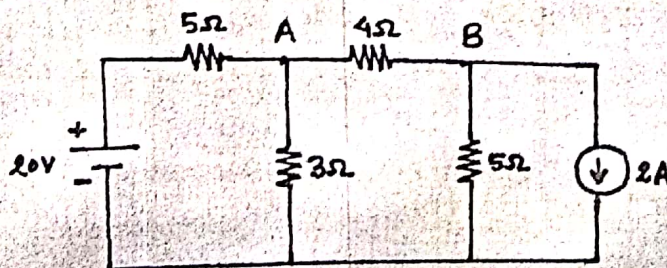


Fig. 2(b)

Contd. ...

(2)

- (c) State Thevenin's theorem with suitable examples of your own. Explain steps for solving network using Thevenin's theorem. 1+5
- 3(a) Find the total current (I) through 4Ω resistor using superposition theorem. 5

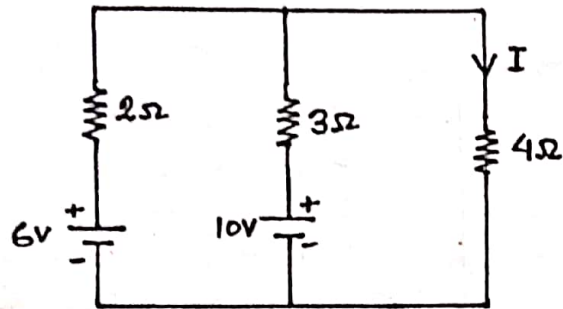


Fig. 3(a)

- (b) Derive the relationship to convert three resistances connected in delta to star and vice-versa. 8
- (c) Explain supermesh with suitable example. 3
- 4(a) Prove that the current flowing through a pure inductor lags the applied voltage by 90° when it is excited by ac sinusoidal voltage. 5
- (b) A resistance of 20Ω and inductance of $0.2H$ and capacitance of $100\mu F$ are connected in series across $220V$, $50Hz$ mains. Determine: (i) impedance, (ii) current, (iii) voltage across R , L and C . 6
- (c) An RLC series circuit consists of a resistance of 1000Ω and inductance of $100mH$ and a capacitance of $10\mu F$. Determine: (i) resonant frequency, (ii) current at resonance. 5
- 5(a) What is transformer. Explain about no-load operation of transformer. 5
- (b) A $50KVA$ single phase transformer has 600 turns on primary and 40 turns on secondary. The primary winding is connected to $2.2KV$, $50Hz$ supply. Determine: (i) secondary voltage at no-load, (ii) primary and secondary currents at full-load. 5

Contd. ...

(3)

- (c) Explain the working principle of synchronous generator.
6. Write short notes on any FOUR: 4x4=
- (a) Earthing
 - (b) Types of dc generator
 - (c) Synchronous speed
 - (d) Working principle of three phase induction motor
 - (e) Maximum power transfer theorem

Maddy

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

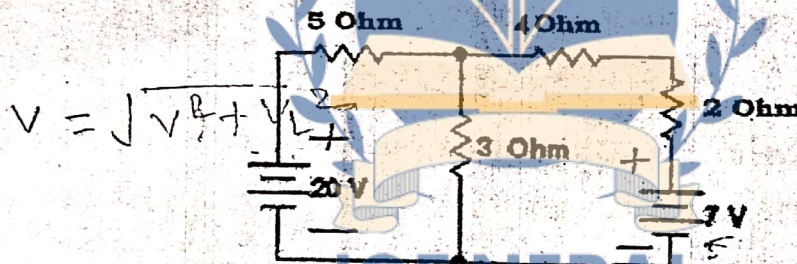
BEG226EL: Electric Circuit & Machines (New Course)

Candidates are required to give their answers in their own words as far as practicable.

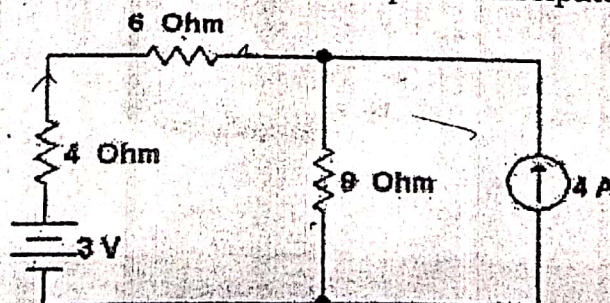
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) Describe the electrical power system consisting of generation, transmission and distribution network with neat sketch. 6
- ✓(b) Explain faraday laws of electromagnetic induction. 4
- ✓(c) Use Kirchhoff's laws to find the current through 3 Ohm resistor in the circuit shown in figure 1(c). Also calculate the power dissipated by it. 4+2



- 2(a) Describe the Kirchhoffs laws with appropriate circuit to describe. 8
- ✓(b) State the superposition theorem and use the theorem to find current through 6 Ohm resistor in the circuit of the figure 2(b) shown below and also calculated power dissipated by it. 8

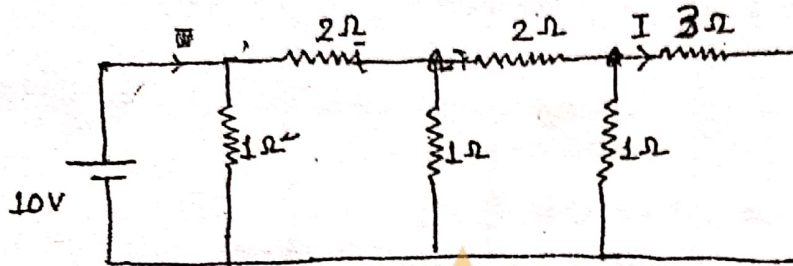


Contd. ...

(2)

3(a) State and explain Maximum Power Transmission Theorem with circuit diagram and necessary derivations. 8

(b) State Thevenin's theorem. Use it to find the current (I) and power dissipated in 3Ω resistor. 8



4(a) A coil of resistance 50Ω and inductance of $0.318H$ is connected in series with a $159\mu F$ capacitor. The resulting circuit is connected across a $220V$, $50Hz$ ac supply. Find: (i) p.f. of the coil and p.f. of the circuit, (ii) active, reactive and apparent power, (iii) circuit current, and (iv) Accumulator voltage across the coil and capacitor. 8

(b) Explain the phenomenon of the resonance in the RLC series circuit excited by the sinusoid voltages V having a frequency of fHz . 8

5(a) What is a DC motor? Explain its operating principle with neat diagram. 8

(b) Explain construction and working principle of transformer. 2+6

6. Write short notes on any FOUR: 8

(a) Ohm's Law

(b) Energy sources

(c) Star-delta transformation

(d) synchronous speed

(e) back emf in dc motor

$4 \times 4 = 16$

PURBANCHAL UNIVERSITY

2016

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG226EL: Electric Circuit & Machines (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

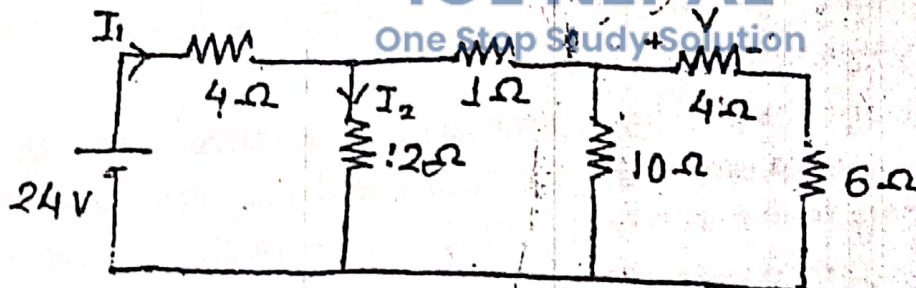
1(a) State Faraday's laws of electromagnetic induction and also derive the expression for dynamically induced emf. 2+4

(b) Find equivalent resistance as seen from XY terminal. 4

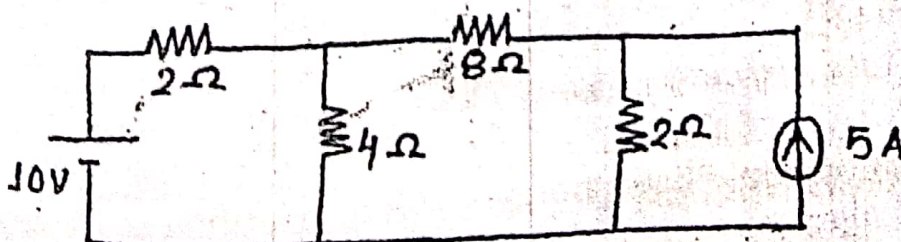


2(a) State and explain Thevenin's theorem. 6

(b) Find I_1 , I_2 and V in the given network. 4



3(a) Determine using superposition theorem, the voltage across 4Ω resistance. 6



Contd. ...

(b) State and explain KVL. 4

4(a) A series circuit having a resistance of 10Ω , an inductance of $0.025H$ and a variable capacitance is connected to a $100V$, $25Hz$ 1ϕ supply. Calculate the value of capacitance when the value of current is $8A$. Also calculate power consumed by the circuit. 6

(b) Define Rms value of alternating current and derive its value in terms of peak value of pure sinusoidal alternating current. 4

5(a) A total current of $10A$ flows through the parallel combination of three impedances $(2 - j5)\Omega$, $(6 + j3)\Omega$ and $(3 + j4)\Omega$. Calculate the current flowing through each branch and circuit power factor. 6

(b) Derive the expression for resonant frequency in series RLC circuit. 4

6(a) Explain the working principle of transformer and also derive its emf equations. 6

(b) A $25KVA$ 1ϕ $2200/220V$ transformer has a primary winding resistance of 1Ω , secondary winding resistance of 0.01Ω , primary leakage reactance of 1.5Ω and secondary leakage reactance of 0.015Ω . Iron loss of transformer is $206W$. Calculate efficiency of transformer at full load, unity power factor. 4

7(a) Explain the working of a dc motor and hence derive torque equation. 6

(b) A long shunt dc generator delivers a current of $20A$ at $200V$. The armature winding resistance is 0.2Ω , series and shunt field resistances are 0.02Ω and 200Ω respectively. Calculate emf generated by armature. 4

8(a) A synchronous motor can't produce torque at starting. Justify. 6

(b) A 4 pole, $50Hz$ induction motor operates at a slip of 0.6 . Calculate the speed of rotor. 4

9. Write short notes on any TWO: 5+5

(a) Incandescent lamp

(b) Generation, transmission and distribution of electrical power

(c) Maximum power transfer theorem

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

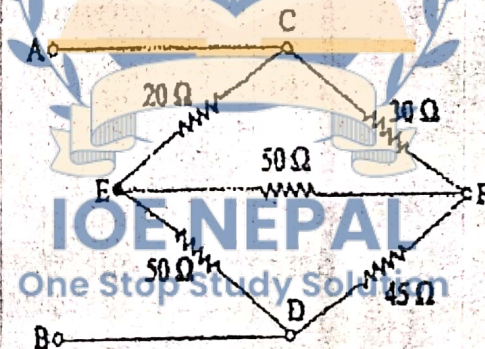
BEG226EL: Electric Circuit & Machines (New Course)

Candidates are required to give their answers in their own words as far as practicable.

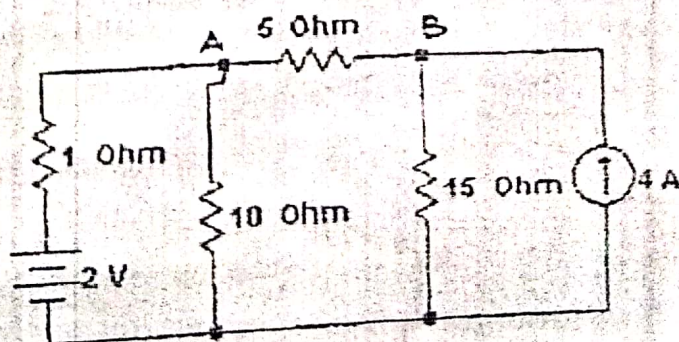
All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

- 1(a) With the help of a neat sketch, explain the operation of a hydroelectric power generation. 4
- (b) State and explain Faraday's laws of electromagnetic induction. 6
- 2(a) How much current will flow when a voltage source of 10V is connected between terminal A and B for the electrical network shown below? 5



- (b) State and prove maximum power transfer theorem. 5
- 3(a) Use Thevenin's theorem to calculate the current through 5 ohm resistor. 5



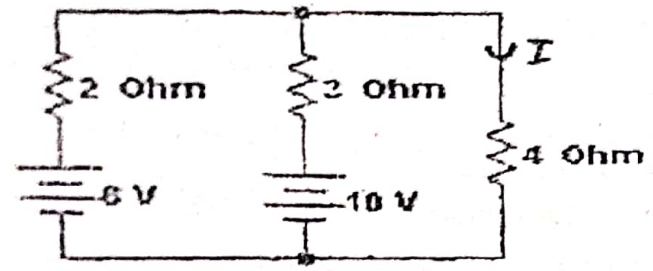
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(3)

(2)

(b) Find the total current (I) by using superposition theorem.

5



(a) What is earthing? Explain importance of earthing.

4

(b) A coil of resistance 10Ω and inductance 0.1 H is connected in series with a capacitor of $150\mu\text{F}$ across 200V , 50Hz supply. Determine impedance, circuit current, active and reactive powers.

6

(a) Differentiate between series resonant circuit and parallel resonant circuit.

6

(b) An AC voltage $(80+60j)$ volts is applied to a circuit and the current flowing is $(-4+10j)$ amperes. Find: (i) Impedance and state whether it is capacitive or inductive, (ii) power consumed and (iii) Phase angle between voltage and current.

4

(a) Explain the working of the "transformer in load" with necessary phasor diagram.

5

(b) A 50KVA single phase transformer has 600 turns on primary and 40 turns on secondary. The primary winding is connected to 2.2KV 50Hz supply. Determine: (i) Secondary voltage at no-load, (ii) Primary and Secondary currents at full-load.

5

(a) What is back emf? Explain the role of back emf in dc motor.

5

(b) A long shunt compound generator delivers 60A to the load at 220 volts . Calculate the emf generated by the armature. Given that the armature winding resistance is 0.04Ω , series field winding resistance is 0.06Ω and shunt field winding resistance is 110Ω .

5

8(a) Explain the construction and working principle of three phase synchronous generator.

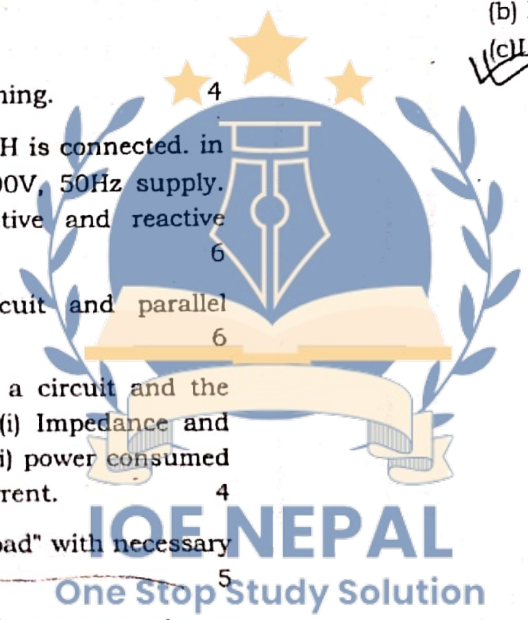
(b) If a 6 pole induction motor supplied from a 3-phase 50Hz supply has a rotor frequency of 2.3Hz . Calculate: (i) the percentage slip, (ii) the speed of the motor.

9. Write short notes on any TWO:

(a) MCB and Fuse

(b) Kirchoffs voltage law

(c) Losses in transformer



PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG221EL: Electric Circuit & Machines

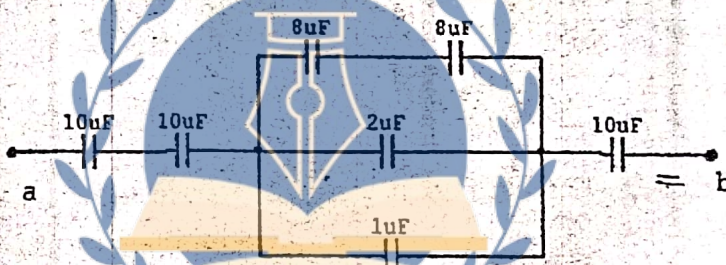
Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer **EIGHT** questions.

1(a) Describe generation, transmission and distribution of electrical energy. Why power is transmitted at high voltage? 6

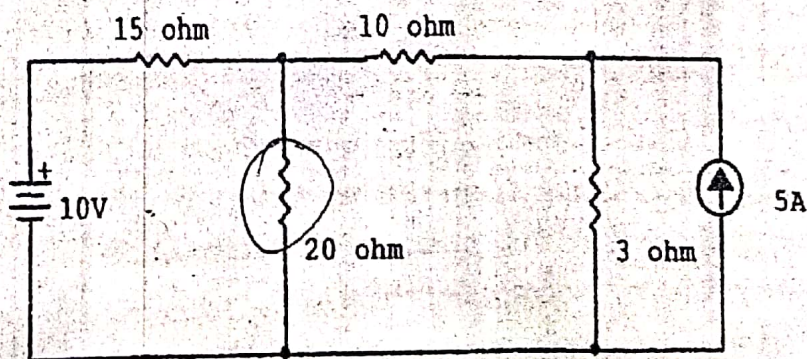
(b) Find the equivalent capacitance of the network shown below: 4



2(a) A wire of length 1m has a resistance of 2 ohm. Obtain the resistance if specific resistance is doubled, diameter is doubled and the length is made three times of the first. 6

(b) State and explain Thevenin's theorem. 4

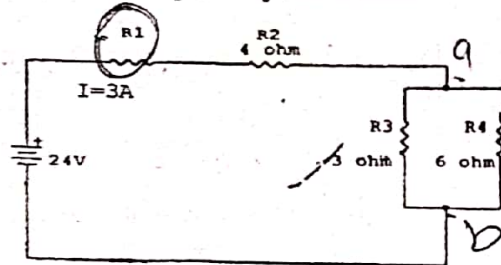
3(a) Using superposition theorems find the current through 20 ohm resistor. 6



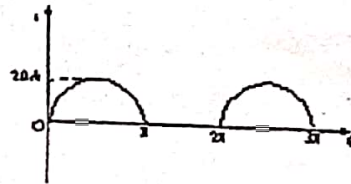
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(2)

- (b) In the circuit shown below, calculate:
- Value of resistance R_1
 - V_{ab}
 - Power dissipated by R_1
 - Total power dissipated by the circuit



- 4(a) Prove that current flowing through a pure capacitor leads the applied voltage by 90° when it is excited by ac sinusoidal voltage.
- (b) An impedance of $(6-j8)\Omega$ is Connected in parallel with an impedance of $(8+j6)\Omega$. The impedance is fed from a 220v, 50 Hz supply. Find current through each branch.
- 5(a) Explain the working principle of Transformer.
- (b) Find rms value of half wave rectified wave whose maximum value is 20A.



- 6(a) What is a DC generator? Explain its operating principle with neat diagram.
- (b) A 25kVA, single phase transformer has 250 turns on the primary and 40 turns on the secondary winding. The primary is connected to 1,500V, 50Hz supply, calculate:
- Primary and secondary currents
 - Secondary emf
 - Maximum flux in the core

(3)

- 7(a) A 6 pole, 50Hz squirrel cage induction motor runs at a speed of 970 rpm. Calculate:
- Synchronous speed N_s
 - Slip s
 - Frequency of rotor current f_r
- (b) Explain the role of back emf in dc motor.
- 8(a) Explain the working principle of induction motor.
- (b) Describe in brief about conceal wiring.
9. Write short notes on any TWO:
- Ohm's law
 - Resonance in parallel ac circuit
 - Losses in Transformer

IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY 2013

B.E. (Civil)/Third Semester/Final

Full Marks: 80 / Pass Marks: 32

Time: 03:00 hrs.

BEG221EL: Electric Circuit & Machines (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer EIGHT questions.

- 1(a) List various forms of energy available in nature with suitable example. 4
- (b) Determine the resistance of a copper tube having external diameter 8cm, thickness 5mm and length 5meters. It is given that specific resistance of copper is $1.70 \mu\Omega\text{-cm}$. 6
- 2(a) Differentiate active and passive elements with suitable example. 3
- (b) Determine the current in the 4Ω resistance of circuit shown in fig.2(b). 7

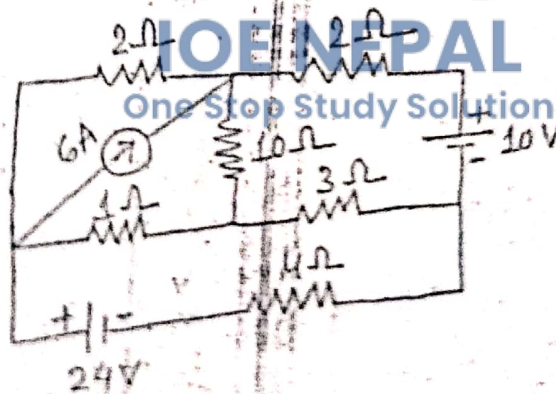


Fig. 2(b)

- 3(a) State and explain superposition theorem. 4
- (b) Find the current through 3Ω resistor using super position theorem for the circuit shown in fig.3(b). 6

Contd. ...

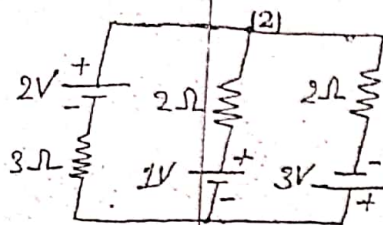


Fig. 3(b)

- (a) Explain series RLC circuit with phasor representation. 4
- (b) A series RLC circuit consists of a 100Ω resistor, an inductor of $0.318H$ and capacitor of unknown value. When the circuit is energized by $230\sqrt{2} \sin \omega t$ volt supply, the current was found to be $i = 3.2\sqrt{2} \sin \omega t$ amperes. Find: 2+2+2
- The capacitance of capacitor
 - The voltage across the inductor
 - The total power consumed, assume $\omega = 314.5$
- 5(a) Define resonance. A coil has resistance of 10Ω and draws a current of $5A$ when connected across $100V$, $50Hz$ source. Calculate the reactive power of the circuit. 1+4
- (b) What do you know about earthing? Explain importance of earthing in electrical engineering as well as civil engineering. 1+4
- 6(a) Explain principle of operation of transformer with necessary waveform and mathematical expression. 5
- (b) A $1000KVA$ $24,000V/2400V$ transformer operates at 40 Volts per turn, Find the number of turns on each winding and the current rating of each winding. 5
- 7(a) Explain the operating principle of d.c. generator. 5
- (b) A 440 volts dc shunt motor has armature winding resistance of 0.8Ω and field winding resistance of 200Ω . Calculate the back emf generated when the motor is giving an output of $10HP$ at 85% efficiency. 5

Contd. ...

(3)

- 8(a) Explain operating principle of three phase induction motor. 4
- (b) A six-pole, 3 phase $11KVA$ synchronous generator is star connected and has a rated per phase voltage of $220V$ for a load with lagging power factor of 0.752 at $50Hz$. The synchronous resistance is 2.1Ω and the armature resistance is assumed to be negligible. Determine the 3+3
- rotor speed
 - emf generated
9. Write short notes on any TWO: 2*5=10
- Back emf of dc motor
 - Star-delta transformation
 - Power factor

PURBANCHAL UNIVERSITY

2018

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG255CI: Engineering Geology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) Differentiate between Geology and Engineering Geology. Why engineering geology is importance in the field of civil engineering project. 2+6
- (b) Write briefly on the internal structure of the earth with suitable diagram. How the layer of the earth was determined? 5+3
- 2(a) What is rock? Write down the petrographic classification of the rock. 2+6
- (b) Define fold? Write down the engineering consideration of fault and joints during civil engineering construction. 2+6
- 3(a) Describe briefly on RQD and RMR? Why Q system is appropriate in Nepal? 3+3+2
- (b) Define Strike and Dip. Calculate the true dip from given apparent dips 1:7 due N45E and 1:10 due N20W. 2+6
- 4(a) What do you know about mass movement? Classify landslide with diagram and explain. 3+5
- (b) Write down the vertical distribution of the sub surface Water? What is Spring? 6+2
- 5(a) What are the type of site investigation? Describe the elements of site investigation of dam in Higher Himalayan zone. 3+5
- (b) Give an outline about Geology of Nepal. What are the major structures found in the Nepal Himalaya? 4+4

Contd. ...

(2)

6(a) Write short notes on any FOUR:

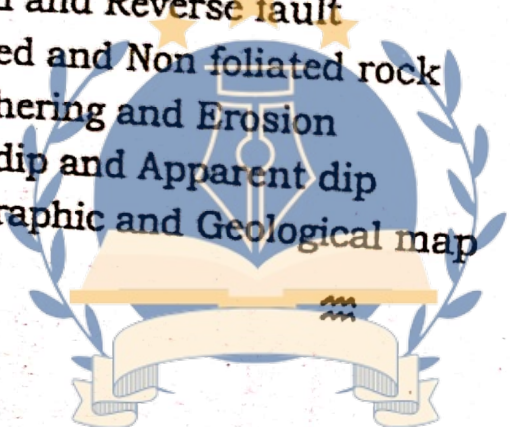
4×2=

- (i) Igneous rock
- (ii) Xenolith
- (iii) Mountain
- (iv) Sedimentation
- (v) Geo-physical Method

(b) Differentiate between (any FOUR):

4×2=

- (i) Normal and Reverse fault
- (ii) Foliated and Non foliated rock
- (iii) Weathering and Erosion
- (iv) True dip and Apparent dip
- (v) Topographic and Geological map



IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY

2017

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG255CI: Engineering Geology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

✓ 1(a) Explain the importance of engineering geology in the field of civil engineering. Illustrate with suitable examples. 5+3

✓ (b) What is plate tectonics. Explain the types of plate boundaries. How the Himalayas were formed. 2+3+3

✓ 2(a) Differentiate rock mass and intact rock with neat diagram. 4
Describe the Geo-mechanics classification of rock mass. 2+6

✓ (b) Define fold and the different parts of fold. Discuss the importance of fold while construction of any civil engineering structure. 4+4

✓ 3(a) Describe the Varnes classification of landslide? Mention the preventative measure of landslide. 5+3

(b) Define rock and rock cycle. Give the classification of igneous rock in detail. 3+5

✓ 4(a) Describe the different stages of engineering geological site investigation method? Describe the geophysical method in brief. 5+3

✓ (b) Define the different type of river channel pattern. Explain the engineering significant of each channel while constructing bridge. 3+5

5(a) Describe briefly the tectonic division of Nepal Himalaya. What are the major challenges that need to be considered during construction in siwalik and lesser Himalaya? 4+4

(2)

- (b) In a featureless terrain three boreholes A, B, and C are sunk to ascertain the attitude of a limestone beds. At site A, limestone bed is reached at a depth of 600 m. Site C is 1800 m to $S10^{\circ}E$ of A and here, limestone bed is reached at the depth of 400 m. Site B is located at 1500 m to $S45^{\circ}W$ of A, and the limestone bed is reached here at a depth of 900m. Determine the attitude (dip, strike and dip direction) of limestone bed. 8

6(a) Write short notes on any TWO: 4+4

- ✓ (i) Landslide 3
- ✓ (ii) Unconformity 2
- (iii) Volcano

(b) Differentiate between (any FOUR):

- (i) Clastic and non-clastic texture 1
- ✓ (ii) Plane failure and wedge failure 1
- ✓ (iii) Confined and unconfined aquifer 2
- ✓ (iv) Joint and bedding plane 1
- (v) Gneiss and Granite

4×2=8

IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY
2016

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 /Pass Marks: 32

BEG255CI: Engineering Geology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

- 1(a) Define engineering geology and explain how do you considered the importance of engineering geology in the field of civil engineering. Illustrate with suitable examples. 2+3+3
- (b) How is the fault identified in the field? Explain the effects of fault that need to be considered while construction of civil engineering structure. 3+5
- 2(a) What are the factors affecting the slope stability? Mention the preventive measures of the landslides. 4+4
- (b) Describe Darcy's law. Explain the types of river channels mentioning the engineering significances of each type. 3+5
- 3(a) What is rock mass classification? Describe the different system of rock mass classification. 2+6
- (b) What is site investigation? Describe various techniques of direct and indirect methods of site investigation for sub surface exploration. 2+6
- 4(a) Three boreholes are sunk at A, B, and C in a featureless terrain to ascertain the attitude of limestone bed. At site A, limestone bed is encountered at a depth of 600m. Site C is 1800m to S10°E of A and here, limestone bed is reached at the depth of 400m. Site B is located at 1500 m to S45°W of A, and the limestone bed is found here at a depth of 900m. Determine the attitude of limestone bed. 8

Contd. ...

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(2)

- (b) Define rock and rock cycle. Describe engineering significant of different types of rocks. 3+5
- 5(a) Sketch and describe the internal structure of the earth in terms of chemical composition, density and nature of seismic waves. 8
- (b) Describe the major tectonic division of the Nepal considering the major hazard of each division. 8
- 6(a) Write short notes on any TWO: 4+4
- (i) Springs and reservoirs
 - (ii) Sandstone
 - (iii) Plunging fold
- (b) Differentiate between (any FOUR): 4×2=8
- (i) Landslide and debris flow
 - (ii) MCT and MBT
 - (iii) Intrusive and extrusive rock
 - (iv) SIAL and SIMA
 - (v) Confined and unconfined aquifer

IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY

2015

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG255CI: Engineering Geology (New Course)

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer ALL questions.

1(a) What is Engineering Geology? Why is Engineering Geology important in Civil Engineering? 2+6

(b) Define plate tectonics and write about plate boundaries in brief. Describe the types and causes of earthquake in detail. 4+4

2(a) How can engineering significance of different rock types be analyzed? Write the engineering significance of faults and joints. 4+4

(b) Two apparent dip amounts are measured to be 1:16 and 1:20 along N30°W and N50° E respectively. Find out the true dip amount. 8

3(a) How are the strengths of rock mass and intact rocks related? Describe the potentiality of different geological formations as aquifers. 3+5

(b) Describe the subsurface site investigation method? What geological factors are to be considered while selecting sites for bridges and dams? 3+5

4(a) How many geological/morpho-tectonic zones have been delineated in Nepal Himalaya? Describe each of these zones focusing on geology and structures. 2+6

(b) Define landslide and slope failure. Write the causes and preventive measures of landslides. 2+6

Contd. ...

(2)

5(a) Write short notes on any FOUR:

4×2=8

(i) RQD

✓ (ii) Importance of metamorphic rocks

✓ (iii) Surface site investigation

(iv) Hydrologic cycle

(v) Pyroclastic materials

(b) Differentiate between (any FOUR):

4×2=8

✓ (i) Limestone and Marble

✓ (ii) Normal fault and reverse fault

(iii) Braided river and meandering river

✓ (iv) Confined aquifer and unconfined aquifer

✓ (v) Crust and Mantle

IOE NEPAL
One Stop Study Solution

PURBANCHAL UNIVERSITY

2014 (New)

B.E. (Civil)/Third Semester/Final

Time: 03:00 hrs.

Full Marks: 80 / Pass Marks: 32

BEG255CI: Engineering Geology

Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

1(a) Define Geology and write its branches? What is the scope of Geology in Civil Engineering? 4+4

(b) On what basis are the different layers within the earth differentiated? Describe the interior of earth with illustrative diagram. 2+6

2(a) How can you judge the engineering significance of different rock types? Write the engineering significance of folds and joints. 4+4

(b) The true dip direction is due S30°E and apparent dip amount is 1:10 due S10°W. What is the amount of true dip? 8

3(a) What are the parameters that influence the strength of rock mass? Describe the Rock Mass Rating (RMR) classification system of Bieniawski, 1979. 5+3

(b) Describe the surface site investigation method? What geological factors are to be considered while selecting sites for tunnels and bridges? 2+6

4(a) Describe the geology of Nepal with a representative geological cross-section from south to north that comprises major geological structures as well. 8

(b) All landslides are mass movements but all mass movements are not landslides. Justify this statement. Write the causes of landslides and their mitigation measures 3+5

Contd. ...

(2)

5(a)

Explain the morphology of river channel. Write down about the spring and reservoir.

2+3+3

6(b)

Define volcanism. Write down the causes and effects of earthquake.

2+6

6(a)

Write short notes on (any FOUR):

4×2=8

(i) Unconformity

(ii) Importance of sedimentary rocks

(iii) Darcy's law

(iv) Hydrologic cycle

(v) Tectonic earthquakes

(vi) Clastic sedimentary rocks

6(b)

Differentiate between (any FOUR):

4×2=8

(i) Convergent plate boundary and divergent plate boundary

(ii) Rock mass and intact rock

(iii) Braided river and meandering river

(iv) Porosity and permeability

(v) Direct and indirect subsurface investigation

(vi) Magnitude and intensity of earthquake



Candidates are required to give their answers in their own words as far as practicable.

All questions carry equal marks. The marks allotted for each sub-question is specified along its side.

Answer FIVE questions.

5×16=80

1(a) What are the branches of Geology? Write about the scope of engineering Geology in Civil engineering projects in Nepal.

(b) What do you mean by Plate Tectonics? Describe the various Plate Boundaries. Explain the effects of an Earthquake.

2(a) What are sedimentary rocks? How the sedimentary rock classified? Describe some sedimentary structure and its role in engineering geology.

(b) What is metamorphism? Describe the physical properties of three metamorphic rocks and its engineering significance.

3(a) What are joints and fracture? Discuss the various joints. Add a note about its importance in civil engineering investigation.

(b) Describe the discontinuities in rock. Briefly describe the Rock Mass Classification and Rock Mass Quality.

4(a) List out the types of mass movements. What are the major causes of Landslides? Mention the preventive measures of Landslide.

(b) Describe the morphology of river channel and its activities for land formation. Discuss the different aquifer types.

5(a) Describe the elements of site investigation of bridge in mountainous area.

Contd. ...

(2)

1(b) What are the methods of Site investigation? How geophysics is applied for geological investigation.

6(a) Briefly describe the Geology of Nepal. Mention the engineering significance of thrusts found in Nepal Himalaya.

1(b) What is seismicity? Describe the seismic waves generated during Earthquake. Discuss the mitigation measures of an earthquake.

7(a) Write short notes on any FOUR:

- (i) Plateau (ii) Volcano (iii) Piezometric surface
- (iv) Geological Map (v) Rock cycle (vi) Ripple marks

1(b) Differentiate between any FOUR:

- (i) Strike slip fault and dip slip fault
- (ii) Granite and Basalt
- (iii) Spread and flows
- (iv) Batholith and stock
- (v) Porosity and permeability
- (vi) Syncline and anticline



IOE NEPAL

One Stop Study Solution

$$k = \frac{v_h}{v_g \left(\frac{dh}{dr} \right)}$$

$$\text{Porosity} = \frac{V_v}{V_T} \times 100\%$$