



Central University of Haryana  
Term End Examination January 2023  
B.Tech. Programme  
Branch: Civil Engineering

211474

Course Code:  
Course Title:

BT CE 207A  
Building Construction and Materials

Max Time: 3h  
Max Marks: 70

**Instructions:**

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks where each part of question carry seven marks. Students are required to attempt any two parts out of three choices for fourteen marks.

**PART -I**

Q. No.1

- ✓(a) Define the function of frog in bricks.
- ✓(b) Draw the structure of a timber.
- ✓(c) Define the dressing of stones.
- ✓(d) Define stone masonry work.
- ✓(e) Draw a diagram of combined footing.
- ✓(f) Define cavity wall construction.
- ✓(g) Define Caisson foundation.

**PART -II**

Q. No.2: Enlist the field tests for bricks. Write the classification of bricks as per IS 1077.

OR

✓Q. No.2: Define Rocks. Write and explain the different types of rocks.

OR

✓Q. No.2: Explain the seasoning of timber and its different methods.

Q. No.3: write and explain three different grades of cement. Write the chemical composition of Portland cement.

OR

✓Q. No 3: Differentiate between Fe-250 (mild steel), Fe-415 and Fe-500 and draw the stress strain behaviour of three grades of steel.

OR

✓Q. No 3: Write in detail the Aggregate Impact Value (AIV) test.

Q. No.4: Define the significance of wall ties in cavity wall construction. Write the advantages of cavity wall construction over conventional brick masonry wall.

OR

✓ Q. No .4: Define brick masonry and explain different types of laying tools.

OR

✓ Q. No .4: Enlist the different modern equipment used in building construction. Explain any five in detail.

✓ Q. No.5: Differentiate between shallow and deep foundation. Enlist the different types of deep foundations and explain skin-friction piles in detail.

OR

Q. No.5: Define DPC and its physical significance. Draw retaining wall with DPC.

OR

✓ Q. No.5: Define the components of stair-case in detail with the help of diagram.



Central University of Haryana  
III Semester Term End Examination January 2023  
B.Tech. Programmes  
Branch: Civil Engineering

Course Code: BTCE 205A  
Course Title: Fluid Mechanics I

Max Time: 3 hours  
Max Marks: 70

Instructions:

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Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub-Question carries two Marks).

Question Numbers in (PART-II) contains questions from 2(two) to 5(five). And each question carries fourteen marks each with internal choice.

**PART -I**

- 1(a) Derive an equation for pressure intensity inside a soap bubble.
- 1(b) Prove that streamline and equipotential lines cut orthogonally each other.
- 1 (c) Find the pressure represented by a column of
- (a) 10 cm of water
- (b) 2 cm of mercury
- 1(d) Write down equation of total pressure around curved surface.
- 1(e) In which condition, cavitation will occur in the venturimeter?
- 1(f) Why Cipolletti weir is used for the discharge measurement?
- 1(g) What are the methods to be used for controlling the separation of boundary layer?

**PART -II**

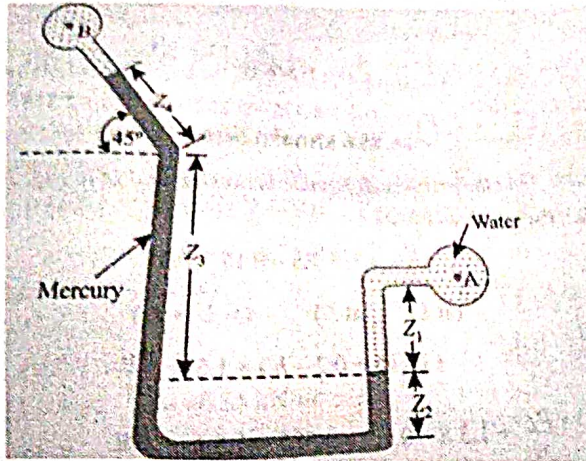
- Q2(a) A sleeve 10 cm long encases a vertical metal rod 3.0 cm in diameter with a radial clearance of 0.02 mm. If when immersed in an oil of viscosity 6.0 poise, the effective weight of the sleeve is 7.5 N, will the sleeve slide down the rod and if so at what velocity.
- Q2(b) A U tube is made up of two capillaries of bores 1.2 mm and 2.4 mm respectively. The tube is held vertical and partially filled with the liquid of surface tension 0.06 N/m and zero contact angle. If the estimated difference in the level of two menisci is 15 mm determine the mass density of the liquid.

or

- Q2(a) A velocity potential for a two-dimensional flow is given by  $\phi = (x^2 - y^2) + 3xy$ . Calculate (i) the stream function and (ii) the flow rate between the streamlines through points (1,1) and (1,2).

**Q2(b)** Derive a Continuity equation for a three-dimensional flow for an incompressible flow, steady and irrotational flow.

**Q3(a)** Find the pressure difference in between A and B. Take  $Z_1 = 0.45$  m,  $Z_2 = 0.225$  m,  $Z_3 = 0.675$  and  $Z_4 = 0.3$  m.



**Q3(b)** An isosceles triangular plate of base width 2.0 m and height 2.0 m is submerged in a liquid of relative density of 0.82 in such a way that its plane makes an angle of 30 degree with the liquid surface. The base of the plate is horizontal and is nearer to the liquid surface than the apex of the plate. If the depth of base of plate is 1.5 m, calculate the total force on one side of the plate and the position of center of pressure.

or

**Q3(a)** Derive an equation for the metacentric height.

**Q3(b)** A cone of specific gravity  $S$  is floating in water with its apex downwards. It has a Radius  $R$  and vertical height  $H$ . Show that for stable equilibrium of cone.

$$H = \left( \frac{R^2 S^{1/3}}{1 - S^{1/3}} \right)^{1/2}$$

**Q4(a)** An orifice meter with orifice diameter 15cm is inserted in pipe of 30cm diameter. The pressure difference measured by mercury oil differential manometer on the two sides of the orifice meter gives a reading of 50 cm of mercury. Find the rate of flow of oil specific gravity 0.9 when the coefficient of discharge of the meter=0.64.

**Q4(b)** Show that velocity of flow through an orifice is given by

$$v = \sqrt{2gH} f \left( \frac{D}{H}, \frac{\mu}{\rho V H}, \frac{\sigma}{\rho V^2 H} \right)$$

Where  $H$  = head causing the flow,  $D$  = diameter of orifice,  $\mu$  = Coefficient of viscosity,  $P$  = density,  $\sigma$  = surface tension and  $g$  = acceleration due to gravity.

or

- Q4(a)** A rectangular contracted weir has a length of 2.5m between the abutments. There are two 0.15m thick rectangular pier-like obstructions on the crest. Estimate the discharge under a head of 0.70m. Assume  $C_d = 0.62$  and the velocity of approach to be negligible.
- Q4(b)** Water discharges at the rate of  $98.2 \times 10^{-3} \text{ m}^3/\text{sec}$  through a 0.12 m diameter vertical sharp edged orifice placed under a constant head of 10 m. A point on the jet measured from the vena contracta has coordinates 4.5 m horizontal and 0.54 m vertical. Find  $C_c$ ,  $C_v$  and  $C_d$  of orifice.
- Q5(a)** A kite 0.8 m x 0.8 m weighing 4 N assumes an angle of 12 degree to the horizontal. The string attached to the kite makes an angle of 45 degree to the horizontal. The pull on the string is 25 N when the wind is blowing at a speed of 30 km/hr. Find the coefficients of lift and drag?
- Q5(b)** Discuss drag force around a sphere with the help of neat sketch.

or

- Q5(a)** How will you determine whether a boundary layer flow is attached flow, detached flow or on the verge of separation of flow.
- Q5(b)** A plate 450 mm x 150mm has been placed longitudinally in a stream of crude oil (specific gravity 0.925 and kinematic viscosity of 0.9 stoke) which flows with velocity of 6 m/s. Calculate:
- (i) The friction drag on the plate
  - (ii) Thickness of the boundary layer at the trailing edge and
  - (iii) Shear stress at the trailing edge

Department of Psychology

Course Name: Psychology and Mental Health (GEC)

Semester-III

Maximum Time: 3 Hours

Course Code: SHSS PSY 03 03 03 GEC 5106

Maximum Marks: 70

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Instructions:

1. Question no. 1 has seven parts and students are required to answer any four. Each part carries three and half Marks.
2. Question no. 2 to 5 have three parts and student are required to answer any two parts of each question. Each part carries seven marks.

Q 1.

(4X3.5=14)

- a) What do you understand by term "Epidemiology"?
- b) Differentiate between Mental Health and Mental illness.
- c) What are the different Types of guidance? Explain Briefly
- d) What do you understand by Reflective listening?
- e) Differentiate between Action Therapy and Insight therapy.
- f) Define Generalized Anxiety disorder (GAD).
- g) Differentiate between Bipolar disorder and Mania.

Q 2.

(2X7=14)

- a. What is the importance of Mental Health in current time? Identify the issue of mental health in India.
- b. Define the concept of epidemiology in detail with reference to disorder like Depression and Suicide.
- c. What are the most prevalent mental health issues worldwide? Explain in details.

Q3.

(2X7=14)

- a. What is anxiety Disorder? Explain its Types in detail.
- b. Describe the various forms of depression including their causes, sign and Symptoms.
- c. Discuss the preventive measure of suicidal behaviour.

**Q4.**

**(2X7=14)**

- a. Explain RAPID model of Psychological first aid in detail.
- b. How would you recognise that an individual needs Psychological support?
- c. Explain different elements of psychological first aid.

**Q5.**

**(2X7=14)**

- a. Enlist types of counselling. Differentiate between Directive and Non Directive Counselling.
- b. Describe different types of therapies used in mental health care and support.
- c. What are the similarities and differences between guidance and counselling?



Central University of Haryana  
Term End Examination January 2023  
B.Tech. Programmes

Branch: Civil/Electrical/Printing packaging  
Course Code: BT AUD 308 A  
Course Title: Environmental Studies

Max Time: 3 Hrs  
Max Marks: 70

**Instructions:**

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub Question carries two Marks). 21/1/24 Anush

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

**PART -I**

Q. No.1

- (a) Give the details account of Hot Spot of Biodiversity?
- (b) What is desert ecosystem discussed in details?
- (c) What is rain water harvesting discussed in detail?
- (d) Give the details account about environment ethics: issues and possible solutions?
- (e) Define the nuclear accident with an example?
- (f) Define is nitrogen cycle in environment with proper sketch?
- (g) How can you move from unsustainable to sustainable development?

**PART -II**

Q. No.2 Define the water pollution discuss in the details with source, effect and control measure?

OR

Q. No.2 Give the details about thermal water pollution? Discuss the issues of ground water pollution with sources, effect and control measure?

Q. No.3 Define the air pollution? Give the detailed account about source, effect and control of air pollution?

OR

Q. No 3 What is the land Resources, land degradation, land slide soil erosion and desertification? Discuss the environmental factor and effects on ecosystem?

Q. No.4 What are forest resources? Give the details account about the use and over exploitation, deforestation, how can we conserve the forest?

OR

Q. No .4 What is the minerals resources? Use and exploitation, environmental affects of mining?

Q. No.5 What is the ecosystem? Structure and functions of ecosystem? Define the energy flow in ecosystem with a model and ecological pyramid?

OR

Q. No.5 What is the food resources? Discussed the world food problems? How affect food issue to the environment and ecosystem?





Central University of Haryana  
Term End Examination January 2023

B. Tech. Programmes  
Branch: Civil Engineering

Course Code: BT CE 203A  
Course Title: Surveying

Max Time: 3 hrs  
Max Marks: 70 marks

**Instructions:**

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub Question carry two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

**PART -I**

Q. No.1

- (a) Define Surveying. Enumerate the applications of surveying.
- (b) Define Rise and fall method and Height of collimation method.
- (c) State the principles of surveying.
- (d) List out the tape corrections.
- (e) Differentiate between simple levelling and compound levelling.
- (f) Define: Contour, Horizontal equivalent and Contour gradient.
- (g) What is Trigonometric Levelling? How it is carried out?

**PART -II**

Q. No.2 (a) Explain the classifications of surveying. Briefly write about the instruments used in Chain surveying.

(b) The bearings of the lines of a traverse are given below. Correct the bearings for local attraction, if any, find the included angles.

Line	Fore Bearing	Back Bearing
AB	68° 15'	248° 15'
BC	148° 45'	326° 15'
CD	224° 30'	46° 00'
DE	217° 15'	38° 15'
EA	327° 45'	147° 45'

OR

Q. No.2 (a) Differentiate between (1) Surveyor's compass and Prismatic compass  
(2) Meridian and Bearing (3) Fore Bearing and Back Bearing (4) Declination and Dip

(b) A steel tape was exactly 30 m long at 20°C when supported throughout its length under a pull of 10 kg. A line was measured with this tape under a pull of 15 kg and at mean temperature of 32°C and found to be 780 m long. Cross-sectional area of the tape = 0.03 cm<sup>2</sup>, and its total weight = 0.693 kg,  $\alpha$  for steel = 11 x 10<sup>-6</sup> per°C and E for steel = 2.1 x 10<sup>6</sup> kg/cm<sup>2</sup>. Compute true length of the line if tape was supported during measurement at every 30 m.

Q. No.3(a) What are the methods of levelling? Describe them briefly.

(b) A gradient of 1 in 400 falling elevation 67.45 m was set out by driving pegs at 100 m intervals with top of pegs on the required gradient. After a time it was suspected that some of the pegs had been disturbed and the following observations were taken for checking elevations. List the errors in the levels of pegs, if any

Station	B.S.	I.S.	F.S.	R.L.	Remarks
1	1.76			64.13	
2	2.64		0.720		
3	1.96		1.420		
4		0.93			Peg 1
5		1.20			Peg 2
6		1.50			Peg 3
7		1.76			Peg 4
8		2.03			Peg 5
9		2.30			Peg 6
10	0.69		2.59		Peg 7
11		0.95			Peg 8
12		1.23			Peg 9
13		1.52			Peg 10
14	0.61		1.21		
15			1.72		B.M.

OR

Q. No.3(a) Describe the various characteristics and uses of contour lines. Define curvature and refraction corrections of trigonometric levelling.

(b) Explain direct and indirect methods of contouring. What are the methods of interpolating contours and how is the interpolation done?

Q. No.4(a) Explain the Tangential method of tacheometry.

(b) The following set of readings refers to observations in a tacheometric survey from station B on stations A, C, and D in clock-wise direction.

Staff Station	Vertical angle	Horizontal circle reading	Stadia hair readings
A		301° 10'	
C	-5° 12'	152° 56'	1.044, 2.283, 3.522
D	+2° 30'	205° 06'	0.645, 2.376, 4.110

The line BA has a bearing of 58° 46' and the instrument constants are 100 and 0. Find the slope of the line CD and its bearing.

OR

Q. No.4(a) Derive distance equation for staff vertical condition and explain the role of analytic lens in stadia tacheometry.

(b) The following are the distances of the staff position from the instrument and the corresponding staff intervals. Calculate the tacheometric constants.

D (m)	20	50	100	120
S (m)	0.195	0.495	0.997	1.197

Q. No.5(a) Explain Total Station and its working. Draw the instrument diagram neatly.

(b) Briefly explain the methods of Tacheometric Surveying.

A tacheometer is placed at a station A and readings on a staff held vertical upon a B.M. of RL = 100.0 meter and at station B are 0.640, 2.200, 3.760 and 0.010, 2.120, 4.230 m respectively. The angle of depression of the telescope in the first case is 6° 19' and in the second case is 7° 42'. Find the horizontal distance from A to B and the RL of station B, if the instrument has constants 100 and 0.5.

OR

Q. No.5(a) What are the elements of a simple circular curve? What is the degree of a curve? Give its relationship with the radius of curve.

(b) Explain the different methods of setting out a simple circular curve.

A railway curve is to be tangential to each of the following lines:

Lines	W.C.B.	Length (m)
AB	$0^\circ$	-
BC	$90^\circ$	220
CD	$140^\circ$	-

Determine the salient parameters of the simple circular curve.



Central University of Haryana  
Odd Semester Term End Examination Jan 2023  
B. Tech. Programme  
Branch: Civil Engineering

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Course Code: BT MAT 215A  
Course Title: Mathematics-III

Max Time: 3 Hours  
Max Marks: 70

**Instructions:**

Question Number one (PART-I) is compulsory and carries a total of 14 marks (Each sub-Question carries two Marks).

Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

**PART -I**

**Q 1.**

- Define semi-group and monoid.
- State Lagrange's theorem for subgroups.
- Define Fourier transform in complex form.

d) Let  $f$  be the function defined as  $f(x) = \begin{cases} x^3 & \text{if } x \geq 1, \\ x & \text{if } 0 \leq x < 1. \\ -x^3 & \text{if } x < 0 \end{cases}$ . Then find the image of  $f$ .

e) Find the Laplace transform of  $\mathcal{L}\left\{t^{\frac{3}{2}}\right\}$ ?

f) Find  $\mathcal{L}^{-1}\left\{\frac{6s-5}{s^2+7}\right\}$ .

g) What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C, D, and F?

**PART -II**

**Q 2.**

a) Define the relation  $\approx$  on  $\mathbb{Z}$  by  $m \approx n$ , in case  $m^2 = n^2$ . (I) Show that  $\approx$  is an equivalence relation on  $\mathbb{Z}$ .

(II) Describe the equivalence classes for  $\approx$ . How many are there?

b) Let  $P = \{1,2,3,4,5,6,7,8,9\}$  and  $Q = \{A, B, C, D, E\}$ .

(I) How many 4-element subsets of  $P$  are there?

(II) How many permutations, i.e., 5-permutations, of  $Q$  are there?

(III) How many license plates are there consisting of 3 letters from  $Q$  followed by 2 numbers from  $P$ ? Repetition is allowed; for example, DAD 88 is allowed.

**OR**

Q 2.

- a) I) Among 200 people, 150 either swim or jog or both. If 85 swim and, 60 swim and jog, how many jog?  
II) For  $m, n \in \mathbb{Z}$ , define  $m - n$  in case  $m - n$  is odd. Is the relation - reflexive? symmetric? transitive? Is - an equivalence relation?
- b) Which of these relations on  $\{0, 1, 2, 3\}$  are partial orderings?  
I)  $\{(0, 0), (1, 1), (2, 2), (3, 3)\}$   
II)  $\{(0, 0), (1, 1), (2, 0), (2, 2), (2, 3), (3, 2), (3, 3)\}$   
III)  $\{(0, 0), (1, 1), (1, 2), (2, 2), (3, 3)\}$   
IV)  $\{(0, 0), (1, 1), (1, 2), (1, 3), (2, 2), (2, 3), (3, 3)\}$   
V)  $\{(0, 0), (0, 1), (0, 2), (1, 0), (1, 1), (1, 2), (2, 0), (2, 2), (3, 3)\}$

Q3.

- a) Determine whether the set together with the binary operation is a semi-group, a monoid, or neither. If it is a monoid, specify the identity.  
I)  $\mathbb{Z}^+$ , where  $*$  is defined as ordinary multiplication.  
II)  $\mathbb{Z}^+$ , where  $*$  is defined as  $\max\{a, b\}$ .  
III)  $\mathbb{Z}^+$ , where  $*$  is defined as  $a$ .
- b) Determine whether the set together with the binary operation is a group. If it is a group, specify the identity and inverse.  
I) The set of real numbers not equal to -1, where  $*$  is defined as  $a * b = a + b + ab$ .  
II) The set of rational numbers, where  $*$  is defined as ordinary multiplication.

OR

Q 3.

- a) Determine whether the set together with the binary operation is a semi-group, a monoid, or neither. If it is a monoid, specify the identity.  
I)  $\mathbb{Z}^+$ , where  $*$  is defined as  $a * b = a + b - ab$ .  
II) The set of even integers where  $*$  is defined as  $a * b = \frac{ab}{2}$ .
- b) Determine whether the set together with the binary operation is a group. If it is a group, specify the identity and inverse.  
I)  $\mathbb{R}$ , where  $*$  is defined as  $a * b = a + b + 2$ .  
II) The set of odd integers where  $*$  is defined as ordinary multiplication.

Q 4.

- a) I) Using Laplace transform show that the  $\mathcal{L}\left\{\int_{u=0}^t u e^{-u} \sin 4u du\right\}$ .  
II) Find the Laplace transform of the function  $f(t) = \begin{cases} t^2, & 0 < t \leq 2 \\ 0, & t > 2 \end{cases}$

- b) Solve the differential equation using Laplace transform  $y'' + 2y' + 5y = e^{-t} \sin t$ ,  $y(0) = 0$ ,  $y'(0) = 1$ .

OR

Q 4.

- a) I) Find the inverse Laplace transform of the function  $\frac{se^{-4s}}{(3s+2)(s-2)}$ .

II) Find the inverse Laplace transform of the function  $\log \frac{s+1}{s-1}$ .

- b) Find the inverse Laplace transform of the function using convolution:  $\frac{16}{(s-2)(s+2)^2}$ .

Q 5.

- a) Find the I) Fourier cosine integral II) Fourier sine integral of the function

$$f(x) = \begin{cases} \sin x & \text{if } 0 \leq x \leq \pi \\ 0 & \text{if } x > \pi \end{cases}$$

- b) Find the inverse Fourier sine transform of  $\frac{1}{s} e^{-as}$ .

OR

Q 5.

- a) Find the Fourier transform of  $f(x) = \begin{cases} \frac{1}{2a}, & \text{if } |x| \leq a \\ 0, & \text{if } |x| > a \end{cases}$

- b) Find the inverse Fourier cosine transform of the function  $\frac{\sin as}{s}$ .



Central University of Haryana  
3<sup>rd</sup> Semester End Term Examination (Regular) Jan 2023

Programme: B.Tech (Civil Engineering)  
Course Code: BT CE 201 A  
Course Title: Strength of Materials

Semester: 3<sup>rd</sup>  
Max Time: 3hrs  
Max Marks: 70

**Instructions:**

Question Number one (PART-I) is compulsory and carries total 14 marks (Each sub Question carries two Marks).  
Question Numbers 2(two) to 5(five) carry fourteen marks each with internal choice.

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**PART -I**

Q. No.1

- A steel rod 1 m long and 20 mm x 20 mm in cross section is subjected to a tensile force of 40 kN. Determine the elongation of the rod, if the modulus of elasticity for the rod material is 200 GPa.
- State clearly Hook's Law.
- A Steel wire of 10 mm diameter is bent into a circular arc of 20 meter radius. Determine the maximum stress induced in it. Take  $E=2 \times 10^5 \text{ N/mm}^2$
- How will you find the strength of a solid shaft?
- Explain the term slenderness ratio and describe with the mathematical expression, how it limits the use of Euler's formula for crippling load.
- State Mohr's I<sup>ST</sup> and II<sup>nd</sup> theorem.
- Define Conjugate beam and give the relation between actual beam and conjugate beam.

**PART -II**

Q. No.2

- Discuss the stress-strain diagram for ductile and brittle material in detail.
- The stresses at point of a machine component are 150 MPa and 50 Mpa both tensile in nature. Find the intensities of normal, shear and resultant stresses on a plane inclined at an angle of  $55^\circ$  with the axis of major tensile stress. Also find the magnitude of the maximum shear stress in the component.
- A simply supported beam 6 m long is carrying a uniformly distributed load of 5kN/m over a length of 3 m from the right end. Draw the shear force and bending moment diagram for the beam and also calculate the maximum bending moment of the section.

Q. No.3

- Define the term bending stress and prove the Relation,

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$$

Where M is bending moment, I is moment of Inertia of the section,  $\sigma$  is bending stress, E is Young's Modulus of Elasticity, R is radius of Curvature.

- A rectangular beam 60 mm wide and 150 mm deep is simply supported over a span of 6 m. If the beam is subjected to central point load of 12 kN, find the maximum bending stress induced in the beam section.
- A 300 mm x 150 mm I-girder has 12 mm thick flange and 8 mm thick web. It is subjected to shear force of 150 kN at a particular section. Find the ratio of maximum shear stress to minimum shear stress in the web. What is the maximum shear stress in the flange?



Q. No.4

- a) Explain the term Torque and Polar modulus. Also find the maximum torque, that can be safely applied to a shaft of 80 mm diameter. The permissible angle of twist is 1.5 degree in a length of 5 m and shear stress not to exceed 42 MPa. Take  $C = 84 \text{ GPa}$
- b) A hollow steel shaft of 300 mm external diameter and 200 mm internal diameter has to be replaced by a solid alloy shaft. Assuming the same values of polar modulus for both, calculate the diameter of the solid alloy shaft and work out the ratio of their torsional rigidities. Take  $C$  (Modulus of Rigidity) for steel as  $2.4 C$  for alloy.
- c) A hollow alloy tube 4 m long with external and internal diameter of 40 mm and 25 mm respectively was found to extend 4.8 mm under a tensile load of 60 kN. Find the buckling load for the tube with both ends pinned. Also find the safe load on the tube, taking factor of safety as 5.

Q. No.5

- a) State the relationship between slope, deflection and radius of curvature of a simply supported beam. Also find the expression for slope of a beam at the support A and deflection of the beam at its centre if a simply supported beam AB of span  $L$  and stiffness  $EI$  carries a concentrated load  $P$  at its centre.
- b) With the help of moment area method find the deflection of the cantilever beam at its free end if a cantilever beam of span 2.8 m is subjected to gradually varying load from zero at the free end to 20 kN/m over fixed end. Take  $EI$  for the cantilever beam as  $8 \times 10^{12} \text{ N-mm}^2$
- c) A beam ACB of length  $L$ , simply supported at the ends has moment of inertia  $4I$  for the length AC and  $I$  for the length CB and is loaded with point load  $W$  at C. Using Conjugate beam method determine i) slope at end A and ii) deflection at mid span. Also compute the numerical values taking  $W = 8 \text{ kN}$ , length of CB portion is 2.5 m and total length ( $L$ ) of beam ACB is 12.5 m,  $I = 5000 \text{ cm}^4$  and  $E = 2 \times 10^5 \text{ N/mm}^2$