

Code: 4G633

II B.Tech. I Semester Supplementary Examinations May 2018

**Fluid Mechanics**

( Civil Engineering)

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Explain about dynamic and kinematic viscosity. How does viscosity of fluid vary with temperature? 6M
- b) Glycerin has a density of  $1260 \text{ kg/m}^3$  and a kinematic viscosity of  $0.00183 \text{ m}^2/\text{s}$ . What shear stress is required to deform this fluid at a strain rate of  $10^4/\text{s}$ ? 8M

**OR**

2. a) What is a manometer? How are manometers classified? Explain with neat sketch the working of pressure gauge. 7M
- b) A single column mercury manometer is used to measure accurate pressure. The pressure head  $H$  measured is within 1% of the true height corresponding to a pressure differential. Find out the tank area is 200, find out the percentage error involved in the difference in pressure by reading the single column height  $H$ . Also sketch the configuration. 7M

**UNIT-II**

3. a) Define and distinguish between streamline, pathline and streakline. 6M
- b) A fluid flow is given by  $V = xy^2 \mathbf{i} - 2yz^2 \mathbf{j} - (zy^2 - \frac{2z^3}{3}) \mathbf{k}$ . Prove that it is a case of possible steady incompressible fluid flow. Calculate the velocity and acceleration at the point (1,2,3). 8M

**OR**

4. A  $25^\circ$  reducing bend is connected in a pipe line, the diameters at the inlet and outlet of the bend being 25cm and 20cm respectively. Find the force exerted by water on the bend if the intensity of pressure at inlet of the bend is  $11 \text{ N/cm}^2$  and rate of flow of water is  $0.80 \text{ m}^3/\text{s}$ . 14M

**UNIT-III**

5. a) Explain the terms: (i) Pipes in parallel (ii) Pipes in series 4M
- b) A compound piping system consists of 1800 m of 50 cm, 1200 m of 40 cm and 600 m of 30 cm pipes of the same material connected in series. (i) What is the equivalent length of a 40 cm pipe of the same material? (ii) What is the equivalent size of a pipe 3600 m long? (iii) If the three pipes are in parallel, what is the equivalent length of a 50 cm pipe? 10M

**OR**

6. a) Explain why a triangular notch is preferred to measure small quantities of flow of water? 4M
- b) A broad crested weir of 50 m length has 50 cm height of water above its crest.
  - i) Find the maximum discharge. Take  $C_d = 0.60$ . Neglect velocity of approach.
  - ii) If the velocity of approach is to be taken in to consideration, find the maximum discharge when the channel has a cross sectional area of  $45 \text{ m}^2$  on the u/s side. 10M

UNIT-IV
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7. a) Derive Hazen Poiseuille equation 7M
- b) An oil of viscosity 1.0 poise and relative density 0.9 is flowing through a horizontal circular pipe of diameter 9 cm and of length 10 m. Calculate the difference of pressure at the two ends of the pipe, if 100 N of the oil is collected in a tank in 35 sec 7M

OR

8. a) Derive the expression for viscous fluid between two parallel plates 7M
- b) An oil of viscosity 8 poise flows between two parallel fixed plates, which are kept at a distance of 30 mm apart. Find the rate of flow of oil between the plates, if the drop of pressure in a length of 1 m be  $0.3 \times 10^4 \text{ N/m}^2$ . 7M

UNIT-V
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9. a) What do you mean by fundamental units and derived units? Give examples. 4M
- b) The discharge  $Q$  over a small rectangular weir is known to depend upon the head  $H$  over the weir, the weir height  $P$ , gravity  $g$ , width of the weir  $L$  and fluid properties: density  $\rho$ , dynamic viscosity  $\mu$  and surface tension  $\sigma$ . Express the relationship between the variables in dimensionless form. 10M

OR

10. a) State Buckingham's  $\pi$ -theorem. Why this theorem is considered superior to Rayleigh's method for dimensional analysis? 7M
- b) Obtain expressions for the velocity ratio and force ratio similitude for a model which obeys Mach's law of similarity. 7M

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II B.Tech. I Semester Supplementary Examinations May 2018

**Mathematics-II**

( Common to CE &amp; ME )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Find the Rank of the matrix  $\begin{bmatrix} 1 & 2 & 1 & 2 \\ 1 & 3 & 2 & 2 \\ 2 & 4 & 3 & 4 \\ 3 & 7 & 5 & 6 \end{bmatrix}$  by reducing it to the normal form. 7M

- b) Prove that the following set of equations are consistent and solve them.

$$3x + 3y + 2z = 1, \quad x + 2y = 4, \quad 10y + 3z = -2, \quad 2x - 3y - z = 5$$

7M

**OR**

2. If  $A = \begin{bmatrix} 1 & 2 & -1 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$  Verify Cayley-Hamilton theorem. Find  $A^4$  and  $A^{-1}$  using Cayley-Hamilton theorem. 14M

**UNIT-II**

3. a) Find a real root of the equation  $x \log_{10} x = 1.2$  which lies between 2 and 3 by bisection method. 7M
- b) Find  $f(2.36)$  from the following table.

x	1.6	1.8	2.0	2.2	2.4	2.6
y	4.95	6.05	7.39	9.03	11.02	13.46

7M

**OR**

4. Evaluate  $\int_0^6 \frac{1}{1+x} dx$  using

(i) Trapezoidal rule (ii) Simpson's  $3/8^{\text{th}}$  rule and compare it with the actual value. 14M**UNIT-III**

5. Solve  $y' = x^2 - y$ ,  $y(0) = 1$  using Taylor's series method and compute  $y(0.1)$ ,  $y(0.2)$ ,  $y(0.3)$  and  $y(0.4)$  14M

**OR**

6. Use Milne's method to find  $y(0.8)$  and  $y(1.0)$  from  $y' = 1 + y^2$ ,  $y(0) = 0$ . Find the initial values  $y(0.2)$ ,  $y(0.4)$  and  $y(0.6)$  from the Runge-Kutta Method. 14M

## UNIT-IV

7. Find the half-range cosine series for  $f(x) = x(2-x)$ , in  $0 \leq x \leq 2$  and hence find sum of the series  $\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots$

14M

OR

8. a) Form a partial differential equation by eliminating the arbitrary function  $f(x)$  and  $g(y)$  from  $z = y f(x) + x g(y)$
- b) Solve by the method of Separation of Variables  $u_x = 2 u_t + u$

7M

7M

## UNIT-V

9. Prove that  $u = e^{-x} [(x^2 - y^2) \cos y + 2xy \sin y]$  is harmonic and find the Analytic function whose real part is  $u$ .

14M

OR

10. Evaluate  $\int_C \frac{\cos f z^2}{(z-1)(z-2)^3} dz$  where  $C$  is  $|z| = 3$  by using Cauchy's integral formula.

14M

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Code: 4G631

II B.Tech. I Semester Supplementary Examinations May 2018

**Strength of Materials-I**

( Civil Engineering )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Define the terms,

i. Prismatic bar

ii. Yield stress

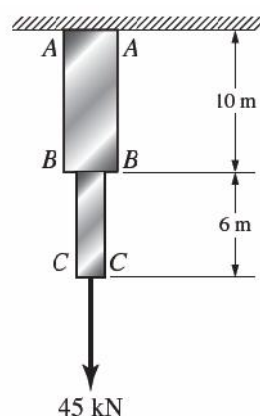
iii. Volumetric strain

iv. True stress

v. Hookes law

8M

- b) Two prismatic bars are rigidly fastened together and support a vertical load of 45 kN, as shown in Fig. The upper bar is steel having length 10 m and cross-sectional area 60 cm<sup>2</sup>. The lower bar is brass having length 6 m and cross-sectional area 50 cm<sup>2</sup>. For steel  $E=200$  GPa, for brass  $E=100$  GPa. Determine the maximum stress in each material.



6M

**OR**2. a) Establish a relationship between **E** and **G** for an isotropic material.

10M

b) What do you mean by a column of uniform strength?

4M

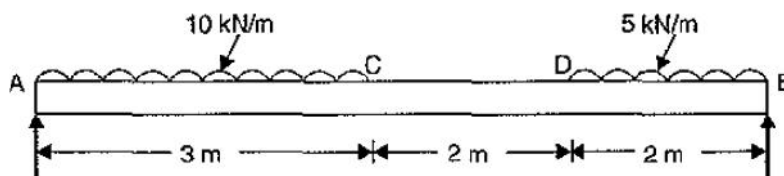
**UNIT-II**

3. A horizontal beam is simply supported at its ends and carries a uniformly distributed load of 40 kN/m between the supports, which are 7.5 m apart. Counter-clockwise moments of 100 and 80 kN-m are applied to the two ends. Draw the B.M. diagram and find (a) the reactions at the supports, and (b) the position and magnitude of the greatest B.M.

14M

**OR**

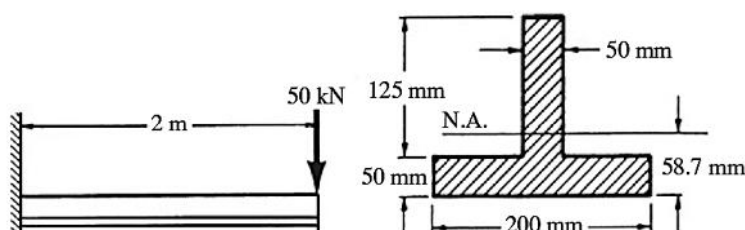
4. Draw the S.F. and B.M. diagrams of a simply supported beam of length 7 m carrying uniformly distributed loads as shown in Fig.



14M

**UNIT-III**

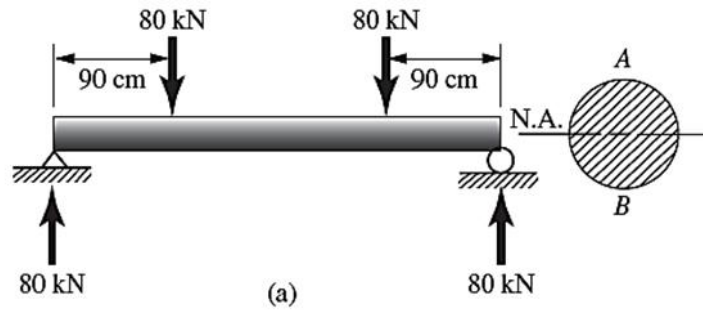
5. Consider the cantilever beam subject to the concentrated load shown in Fig. Determine the maximum shearing stress due to **F** in the beam and also determine the shearing stress 25 mm from the top surface of the beam at a section adjacent to the supporting wall.



14M

OR

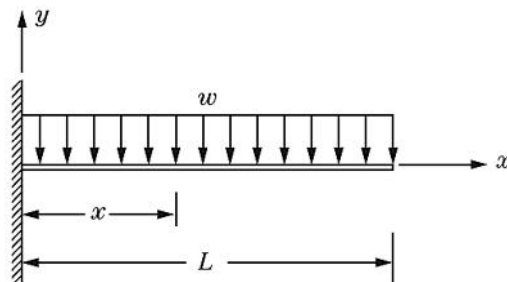
6. A beam of circular cross section is 18 cm in diameter. It is simply supported at each end and loaded by two concentrated loads of 80 kN each, applied 90 cm from the ends of the beam as shown in Fig. Determine the maximum bending stress in the beam.



14M

## UNIT-IV

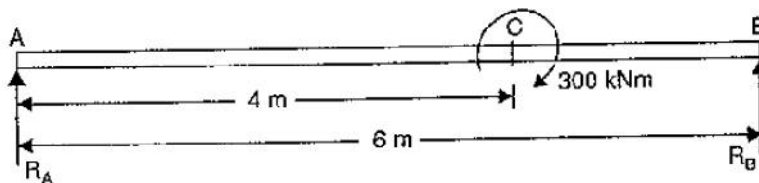
7. Determine the deflection curve of a cantilever beam subject to the uniformly distributed load  $w$ , shown in Fig.



14M

OR

8. A horizontal beam AB is simply supported at A and B, 6 m apart. The beam is subjected to a clockwise couple of 300 kNm at a distance of 4 m from the left end as shown in Fig. If  $E = 2 \times 10^5 \text{ N/mm}^2$  and  $I = 2 \times 10^8 \text{ mm}^4$ , determine:
- deflection at the point where couple is acting and
  - the maximum deflection.



14M

## UNIT-V

9. a) Draw a 2D stress element at a point in a material which is subjected to pure torsion. Find out the following from Mohr's circle.
- Principal stresses
  - Max shear stress
  - Principal planes
  - Max. shear stress plane
- b) State the maximum shear stress theory of failure. For which materials it is preferred.

10M

4M

OR

10. State the significance of static theories of failure in design. Draw the failure envelopes for different theories of failure in 2D.

14M

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II B.Tech. I Semester Supplementary Examinations May 2018

**Surveying**

( Civil Engineering )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) What is the need of surveying? Classify the survey based on the purpose of surveying. 7M

- b) Determine the true bearing of a line AB If the

(i) Magnetic bearing of a line AB is  $110^{\circ}43'$  and declination is  $1^{\circ}05'E$ ,

(ii) Magnetic bearing of a line AB is  $N25^{\circ}45'45''W$  and declination is  $2^{\circ}46'W$ . 7M

**OR**

2. a) What do you understand by surveying? Briefly explain the principles of surveying. 7M

- b) What are the various adjustments done on a surveyor's compass? 7M

**UNIT-II**

3. a) The caption of ship standing on the deck, just sees a light house of 75 m above MSL. If the caption, s eye is 7 m above MSL then what is the distance of light house from the captain? 7M

- b) Given below are the perpendicular offsets that were taken from a chain.

Chainage(m)	0	30	60	90	120	150	180	210
Offset (m)	0	8.76	7.89	9.43	8.44	7.54	7.35	8.75

Compute the area between the chain line and irregular boundary by, Simpson's rule 7M

**OR**

4. The following consecutive readings were taken with a level on a 4 m staff on a continuously sloping ground at an interval of 20 m: 0.650, 1.535, 1.850, 2.435, 2.995, 3.350, 1.150, 1.850, 2.045, 3.635, 0.905, 1.055, 1.750. 2.550. The RL of the first point is 110.780. Rule out the page of level book by height of collimation method and record the above readings. Calculate RL of various points. 14M

**UNIT-III**

5. Briefly describe the construction and working of Theodolite in details. What are its uses? 14M

**OR**

6. a) The following bearings were observed for a closed traverse.

Line	FB	BB
AB	$124^{\circ}30'$	$305^{\circ}30'$
BC	$68^{\circ}15'$	$246^{\circ}$
CD	$310^{\circ}30'$	$135^{\circ}15'$
DA	$200^{\circ}15'$	$17^{\circ}45'$

Find out the corrected bearing of all lines.

- b) A man standing at a point sees the top of a building and the line of sight makes an angle of  $60^{\circ}$  from vertical. When the man moves 15 m towards the building the angle becomes  $40^{\circ}$  from horizontal. What is the height of the building? 7M

UNIT-IV
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7. a) In an ordinary stadia telescope, the focal length is 25 cm. the tacheometric constants are  $K=100$  and  $c=0$ . An error of 0.0040 cm exists in stadia interval. What will be the numerical error in computed horizontal distance if staff intercept is 1.2 m. 7M
- b) Write various advantage and disadvantages of plane table surveying. 7M

## OR

8. a) If you want to conduct a plane table survey on an area, write down the various steps taken in the plane table survey by 2 point problem. 7M
- b) The stadia readings with sight horizontal taken on a vertical staff 72 m away from the tacheometer were 1.250 m and 1.685 m. The focal length of the object lens was 35 cm and distance between object lens and vertical axis of tacheometer was 20 cm. find the stadia interval. 7M

UNIT-V
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9. A circular curve of radius 250 m is to be inserted between two straight meetings at a deflection angle  $70^\circ$ . What is the degree of curve by arc definition and by chord definition? Also find the length of curve, tangent length, and length of long chord, apex distance and mid-ordinate. 14M

## OR

10. a) How you will set out the horizontal circular curve by two theodolite method? 7M
- b) What are linear methods of setting out a simple circular curve? Discuss any two methods in brief. 7M

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