



**B.Tech III Semester Supplementary Examinations, December 2024**

**MECHANICS OF SOLIDS  
(ME)**

**Maximum Marks: 70**

**Date:11.12.2024**

**Duration: 3 hours**

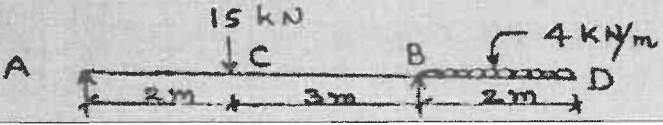
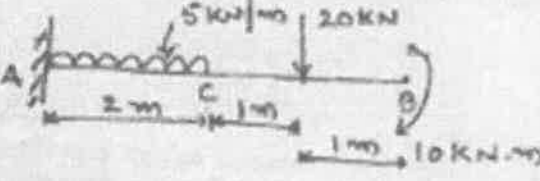
- Note:
- 1.This question paper contains two parts A and B.
  2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
  3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
  4. Each question carries 10 marks and may have a, b, c, d as sub questions.

**Part-A**

All the following questions carry equal marks (10X2M=20) Marks)		CO	Bloom Tx
1	Define lateral strain and poissons ratio.	1	L1
2	Define the terms(i) strain energy (ii) proof resilience	1	L1
3	Write the different types of beams?	2	L1
4	Define principal stresses and plane	2	L1
5	What is the volumetric strain of thin cylinders?	3	L1
6	Define Hook's law.	3	L1
7	A cantilever beam of length 2m fails when a load of 2 kN is applied at the free end. If the section of beam is 40mm X 60mm, find the stress at the failure	4	L1
8	Define the terms Principal planes and principal stresses	4	L1
9	What is polar modulus?	5	L1
10	What is hoop-stress and volumetric strain in shells?	5	L1

**Part-B**

Answer All the following questions. (5X10M=50Marks)		CO	Bloom Tx
11	A reinforced concrete column of 400 mm x 400mm has four steel rods of 20 mm embedded in it. Find the stresses in steel and concrete when the total load on the column is 1000 KN. $E_s = 210 \text{ KN/mm}^2$ and $E_c = 13.5 \text{ KN/mm}^2$ [10M]	1	L2
OR			
12	An axial pull of 40000N is acting on a bar consisting of three sections of length 30 cm, 25cm and 20cm and diameters 2cm, 4cm and 5cm respectively. If the young's modulus = $2 \times 10^5 \text{ N/mm}^2$ , determine (i) stress in each section and (ii) total extension of the bar [10M]	1	L2
13	Draw SFD and BMD of the following beam shown in figure [10M]	2	L2

			
	OR		
14	<p>Draw SFD and BMD of the following beam shown in figure [10M]</p> 	2	L2
15	<p>A beam of 36 cm deep of symmetrical section has <math>I=8000 \text{ cm}^4</math> is simply supported over a span of 8m. Calculate i) the uniformly supported load it may carry ii) the concentrated load it may carry at the centre. Maximum allowable stress= <math>111 \text{ N/mm}^2</math>. [10M]</p>	3	L2
	OR		
16	<p>A beam of I-section, 60 cm deep and 19 cm wide, has flanges 4 cm thick and web 1.6 cm thick. It carries a shearing force of 400 kN at a section. Draw shear stress distribution diagram. [10M]</p>	3	L2
17	<p>A steel tube of 10 mm. bore with a wall thickness of 1 mm is 1 m. long is full of mercury in the tube. It is placed horizontally and supported at the ends. If the density of steel and mercury is 7.5 and 13.6, find the maximum stress in the tube [10M]</p>	4	L2
	OR		
18	<p>A steel specimen is subjected to the following principal stresses <math>120 \text{ N/mm}^2</math> (Tensile) <math>50 \text{ N/mm}^2</math> (compressive). If the proportionality limit for the steel specimen is <math>225 \text{ N/mm}^2</math>, find the factory of safety according to: i) Maximum principal stress theory ii) Maximum principal strain theory iii) Maximum shear stress theory. [10M]</p>	4	L2
19	<p>Draw "Mohr's stress circle" for principal stresses of <math>80 \text{ N/mm}^2</math> tensile and <math>40 \text{ N/mm}^2</math> compressive and find the resultant stresses on planes making <math>25^\circ</math> and <math>60^\circ</math> with the major principal plane. Find also normal and tangential stresses on these planes? [10M]</p>	5	L2
	OR		
20	<p>A thin cylindrical shell of 0.6m diameter and 0.9 m long is subjected to an internal pressure <math>1.2 \text{ N/mm}^2</math>. Thickness of cylinder wall is 15mm. Determine change in diameter, length and volume. Take <math>E=200 \text{ GPa}</math> and poisson's ratio=0.3. [10M]</p>	5	L2