Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2023

Course: Strength of Materials
Semester: IV
Program: B.Tech (FSE) **Time : 03 hrs.**
Course Code: MECH2018 **Max. Marks: 100**

Instructions:

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Write relationship between tensile stress, tensile strain and young's modulus.	**4**	**CO1**
Q 2	Define Poisson's ratio.	**4**	**CO1**
Q 3	Why the knowledge of "strength of materials" is important?	**4**	**CO5**
Q 4	What is factor of safety? Support your answer with suitable example.	**2+2**	**CO1**
Q 5	Determine the Poisson's ratio and bulk modulus of a material for which Young's modulus is 10^5 MPa and modulus of rigidity is 3x10^4 MPa.	**4**	**CO1**

SECTION B
(4Qx10M= 40 Marks)

Q 6	A tensile test was conducted on a mild steel bar. The following data was obtained from the test: i. Diameter of the steel bar = 4 cm ii. Gauge length of the bar = 22 cm iii. Load at elastic limit = 250 kN iv. Extension at a load of 160 kN = 0.235 mm v. Maximum load = 390 kN vi. Total extension = 70 mm vii. Diameter of rod at failure = 2.35 cm Determine: a) The Young's modulus (3 marks) b) The stress at elastic limit (2 marks) c) The percentage of elongation (2 marks)	**10**	**CO1**

	d) The percentage decrease to area. (3 marks) **OR** Two bars made of copper and aluminum are of equal length and have cross section 555 and 1020 sq.mm respectively. They are rigidly connected at their ends. If this compound member is subjected to a longitudinal pull of 255 kN, estimate the proportional of the load carried on each rod and the induced stresses. Take the value of E for copper = 1.4×10^{5} N/mm^2 and for aluminum = 0.8×10^5 N/mm^2.	**5+5**	
Q 7	(i) A circular shaft is subjected to a torque of 10 kNm. The power transmitted by the shaft is 209.33kW. Find the speed of shaft in revolution per minute. (ii) Write about Torsional equation.	**6** **4**	**CO2**
Q 8	i) Write the expression for following type of column end conditions: a. Both Ends Hinged. b. Both Ends Fixed. c. One End Fixed and Other Hinged. d. One End Fixed and Other Free. ii) A rectangular beam of breadth 100 mm and depth 200 mm is simply supported over a span of 4 m. The beam is loaded with an uniformly distributed load of 5 kN/m over the entire span. Find the maximum bending stresses.	**4** **6**	**CO2**
Q 9	Fire represents a severe hazard in both developing and developed countries and poses significant threat to life, structure, property, and environmental safety. Material degradation has strong potential to cause fire. Explain how "Strength of Materials "knowledge can ensure fire accidents do not cause any calamity to life, properties and environment.	**10**	**CO5**
SECTION-C **(2Qx20M=40 Marks)**			
Q 10	(i) A simply supported beam of span 4m is subjected to a uniformly distributed load of 2 kN/m over its entire length. Sketch the bending moment and shear force diagram for the beam. (ii) Draw the SFD for the following loading:	**10** **10**	**CO3**

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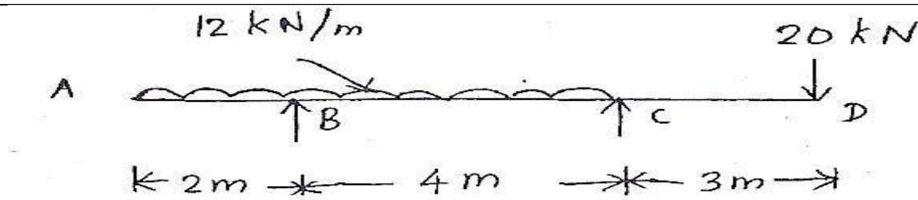
<tr><td></td><td>
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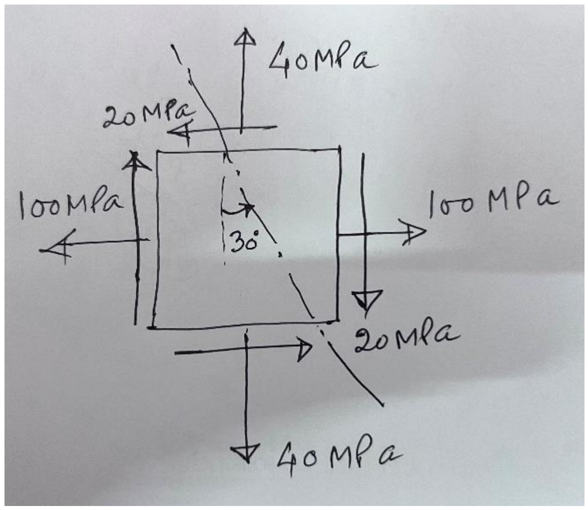
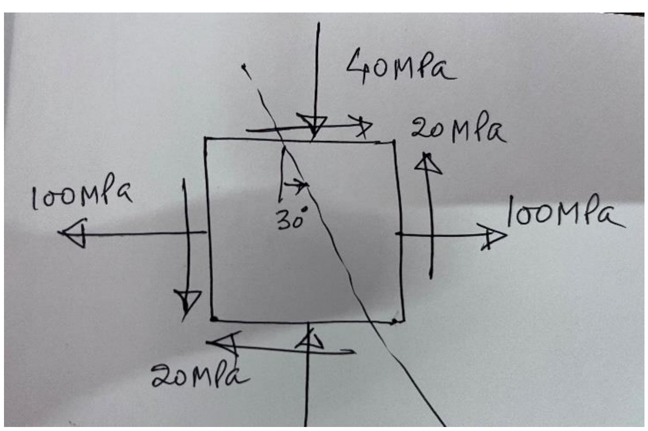
<tr><td>Q 11</td><td>For the state of plane stress as shown in the figure below:


1. Draw the Mohr's circle and indicate the points that represent stresses on face X and on face Y. (6 marks)
2. Using the Mohr's circle, determine the normal and shear stress on the inclined plane shown in the figure and label this point as N on the Mohr's circle. (6 marks)
3. Also determine minimum and maximum principal stresses (4 marks)
4. Also mark maximum shear stress point on Mohr's circle diagram. (4 marks)

OR

</td><td>20</td><td>CO4</td></tr>
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	1. Draw the Mohr's circle and indicate the points that represent stresses on face X and on face Y. (6 marks) 2. Using the Mohr's circle, determine the normal and shear stress on the inclined plane shown in the figure and label this point as N on the Mohr's circle. (6 marks) 3. Also determine minimum and maximum principal stresses (4 marks) 4. Also mark maximum shear stress point on Mohr's circle diagram. (4 marks)		