Sanjay Ghodawat University, Kolhapur
Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

2018-19
EXM/P/09/01

Year and Program:2018-19 | **School of Technology** | **Department of Mechanical Engineering**

Course Code: MET 209 | **Course Title Strength of Materials** | **Semester – III**

Day and Date: 06 Dec 2018 | **End Semester Examination (ESE)** | **Time:2.30 to 5.30** | **Max Marks: 100**

Instructions:
1) All questions are compulsory.
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks.

			Marks	Bloom's Level	CO
Q.1	a)	A member is ABCD is subjected to point load P_1, P_2, P_3 and P_4 as shown in fig 1.a Calculate the force P_2 necessary for equilibrium, if P_1=45 kN, P_3=450 kN and P_4=130 kN. Identify the total elongation of the member, assuming the modulus of elasticity to be 2.1 $\times 10^5$ N/mm^2	09	L3	CO1

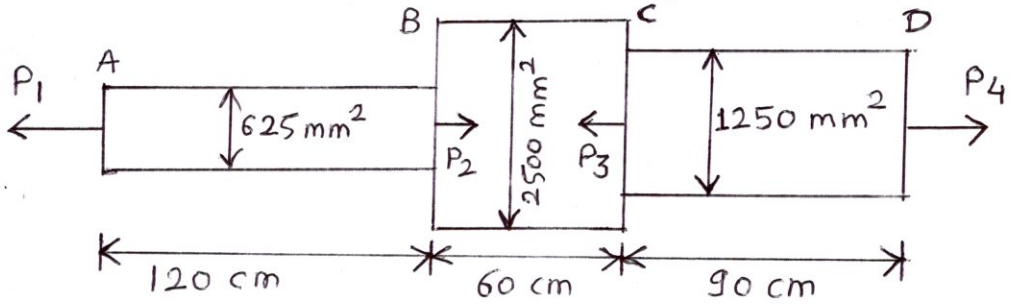

Fig 1.a

OR

Q1	a)	Define bulk modulus and derive relation between modulus of elasticity and bulk modulus	09	L1	CO1
Q1	b)	An elemental cube is subjected to stresses as shown in figure 1.b Construct Mohr's circle of stresses and hence find magnitude of principle stresses	07	L3	CO2

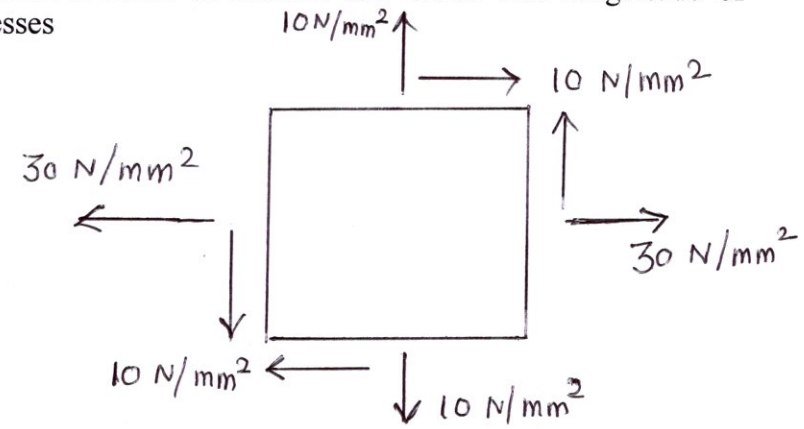

Fig. 1.b

			Marks	Bloom's Level	CO
Q 2	a)	A cantilever beam is as shown in figure 2.a Construct SFD and BMD for the cantilever beam.	10	L3	CO3

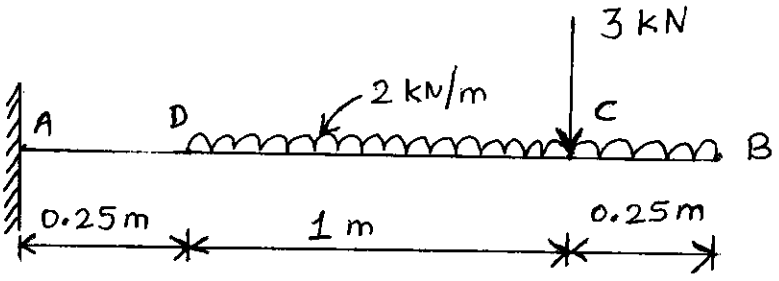

Fig. 2.a

Q 2	b)	A rectangular beam 100 mm wide and 250 mm deep is as shown in figure 2.b. The beam is subjected to a maximum shear force of 50 kN. Determine Shear stress at a distance of 25 mm above Neutral Axis.	06	L5	CO4

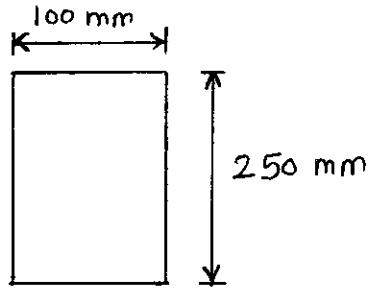

Fig. 2.b

Q 3.	a)	A point in a strained material is as shown in figure 3.a. Find 1. Major principal stress 2. Minor principal stress and 3. Location of principal planes.	08	L1	CO2

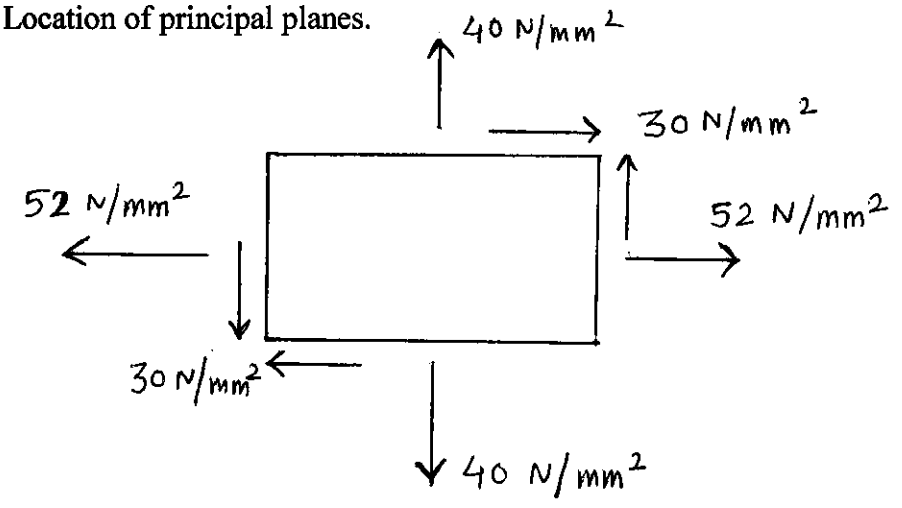

Fig. 3.a

			Marks	Bloom's Level	CO
Q 3	b)	A simply supported beam has I shape cross section as shown in figure 3.b. The simply supported beam carries UDL of 40 kN/m on entire span of 10 meters. Find maximum bending stress produced.	08	L1	CO4

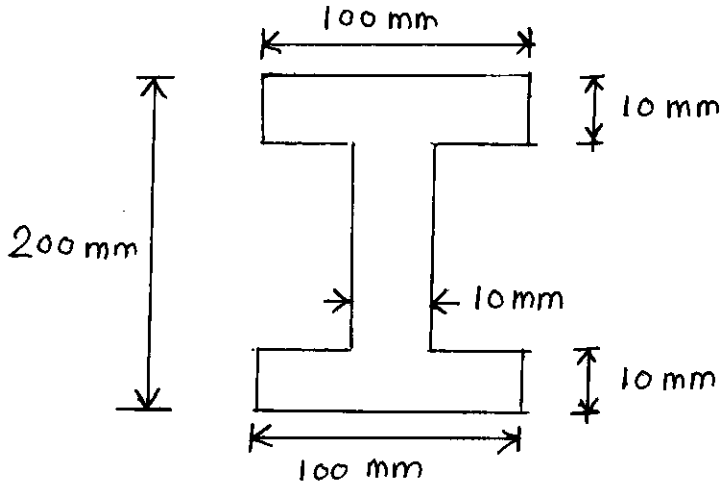

Fig. 3b.

Q 4	a)	For a simply supported beam of length L with central load W, show that deflection at the load point is $y = \frac{WL^3}{48\,E\,I}$ Use Double Integration Method	10	L2	CO5
Q 4	b)	A simply supported beam of a span 6 m. is carrying a UDL of 2 kN/m over the entire span. Find the maximum slope and deflection of beam. Assume EI for beam=100×10^{12} Nmm.	08	L1	CO5
Q 5	a)	List out the basic assumptions for shear stress in a circular shaft subjected to torsion	04	L1	CO6

			Marks	Bloom's Level	CO
Q 5	b)	Identify the diameter of a solid shaft which will transmit 90 kW at 160 rpm if the shear stress in the shaft is limited to 60 MPa. Find also the length of shaft if the twist must not exceed 1 degree over the entire length. Assume C= 8×10^4 N/mm^2	08	L3	CO6
Q5	c)	List various end conditions and corresponding equivalent lengths of column	06	L1	CO6
Q 6	a)	Develop the equations for the slope and deflection of cantilever beam of length L and point load W at free end of beam. Use double Integration method	08	L2	CO5
Q 6	b)	An I section is as shown in fig. 6.b. This I section is used as a cross section for a column which is fixed at both the ends. Identify Euler's crippling load for that column. Assume E= 205 MPa and length of column is 6 m.	08	L2	CO6

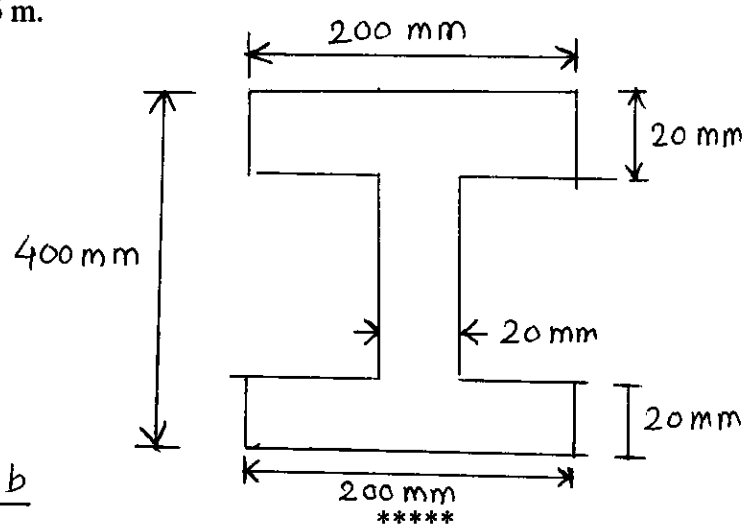

Fig 6.b

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