Reg. No.										

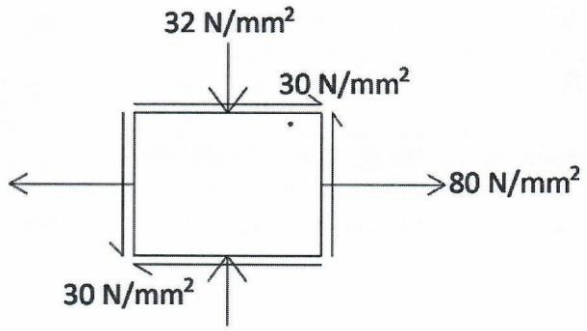
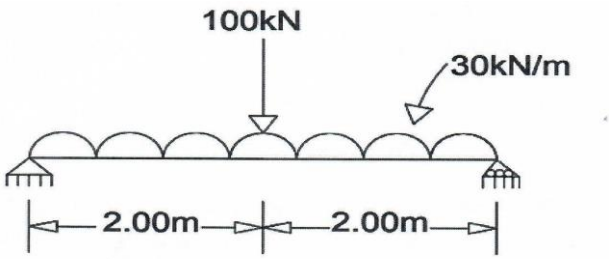
MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

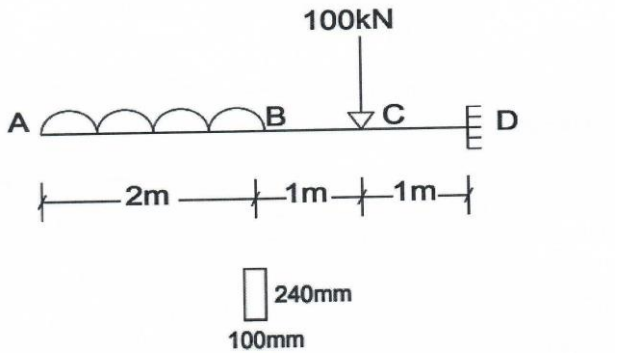
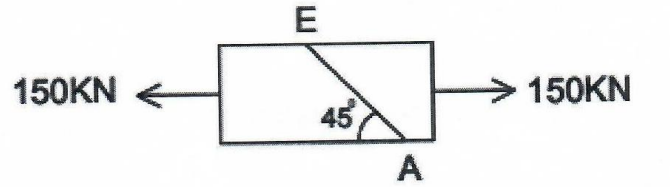
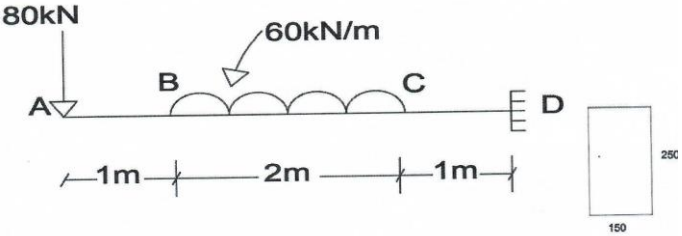
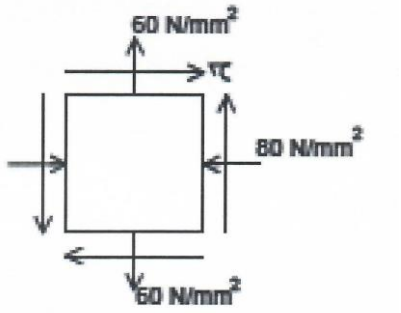
IV SEMESTER B.TECH (CIVIL ENGINEERING)
END SEMESTER EXAMINATIONS, MAY/JUNE 2022
SUBJECT: **STRENGTH OF MATERIALS [CIE 4306]**
REVISED CREDIT SYSTEM
(_ / / 2022)

Time: 3 Hours Max. Marks: **50**

Instructions to Candidates:

- Answer ALL the questions
- Missing data may be suitably assumed

Q.No		Marks	CO
1A.	The state of stress at a point in a material is as shown in the figure. Locate the principal planes and plane of maximum shear stress. Also find the magnitude of principal stresses and maximum shear stress. – 	5	4
1B.	Draw the shear force diagram and bending moment diagram for the following beam loaded as shown in the figure. 	3	1
1C.	Find deflection at free end of a cantilever of span "L", loaded with a concentrated load at free end. Assume flexural rigidity as "EI", considering double integration method.	2	2
2A.	A shaft of 6 m length of 100 mm diameter is subjected to a torque of 12 kNm. It is also subjected to a direct tensile load of 120 kN. Find whether it fails, if the maximum normal stress is limited to 100 N/mm^2.Assume modulus of rigidity as 82 GPa.	5	3
2B.	A power of 100 kW has to be transferred through a solid circular shaft at 180 RPM. Find the diameter of the shaft, if allowable shear stress is 50 N/mm^2.	3	3
2C.	Find deflection at the free end of a Cantilever of span 2.5 m subjected to a udl of 40 kN/m throughout. Assume EI as 8.5 x 10 ^{12} Nmm^2.	2	2
3A.	The Principal stresses at a point in a strained material are 87.53 (T)N/mm^2 and 39.53N/mm^2 (C). Find normal and tangential stress on a plane inclined at an angle of 14 ° to the major principal plane.	5	4

3B.	A cantilever beam of span 4 m, carries loads as shown in the figure. Find the shear stress at the neutral axis for the cross section at the point B. Also find the principal stress at neutral axis. The beam is 100 x 240 mm deep. Assume the UDL as 20 kN/m.  C/S of beam	3	4
3C.	Explain power transmitted by shaft .Also explain modulus of rigidity.	2	3
4A.	A block is subjected to a force of 150 kN. Find the resultant stress on a plane AE inclined at 45 ° to horizontal. Assume the cross sectional dimension of the block as 100 mm x 50 mm. 	5	4
4B.	A cantilever beam of span 4 m, carries loads as shown in the figure. Find the 3 slope at free end. Take young's modulus as 2 x 105 N/mm^2. The cross section of the beam is 150 mm x 250 mm. 	3	2
4C.	Write the torsion equation and explain the various terms.	2	3
5A.	The normal stresses across two planes at right angles to each other are 80 N/mm^2 (compressive) and 60 N/mm^2(tensile). The major principal stress is known to be 160 N/mm^2. Find shear stress on the said two planes. 	5	4
5B.	Calculate the bending stress at a depth of 30 mm from top of the beam, in the beam where bending moment is 20 kNm. Assume cross section of beam as rectangular with 100 x 180 mm depth. Also calculate the principal stress at the top of the section.	3	1
5C.	State any one difference between long column and Short column. Also Define buckling load	2	4