

**DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,**  
**LONERE – RAIGAD – 402 103**  
**End Semester Examination – Summer 2019**

**Branch: B. Tech in Civil Engineering**

**Subject Name: Mechanics of Solids**

**Max. Marks: 60**

**Date: - 29/05/2019**

**Semester: III**

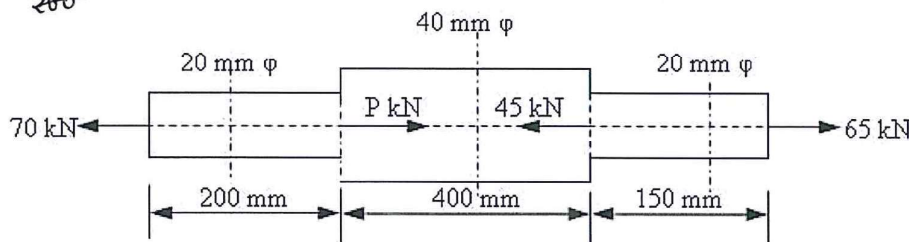
**Subject Code: BTCVC 302**

**Duration: 3 Hrs.**

**Instructions to the Students**

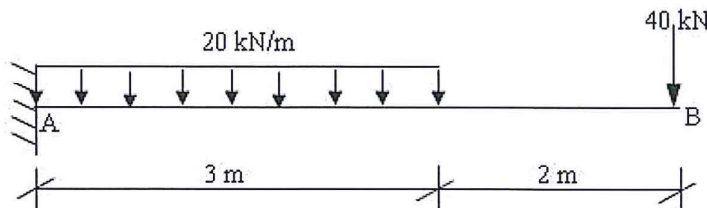
1. Attempt any five questions out of the following.
2. The level questions/ expected answer as per OBE or the course outcome (CO) on which the question is based is mentioned in ( ) in front of the question.
3. Use of non-programmable scientific calculators is allowed.
4. Assume suitable data wherever necessary and mention it clearly.
5. Illustrate your answers with neat sketches, diagram etc., wherever necessary.

		(Level/ CO)	Marks
Q. 1 (a)	Draw Stress-Strain curve of mild steel. Write characteristic points of the curve.	L 2	02
Q. 1 (b)	A compound composite bar is subjected to forces as shown in the figure 1. Find the force P for equilibrium. Find change in length of the composite bar. The material of 200 mm length is steel, 400 mm length is copper and 150 mm length is alluminium. Use $E_s = 200 \text{ GPa}$ , $E_c = 100 \text{ GPa}$ and $E_{Al} = 70 \text{ GPa}$	L 4	10



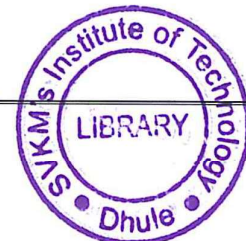
**Figure 1**

Q. 2	Analyse the beam as shown in the figure 2 and hence draw the Shear Force Diagram and Bending Moment Diagram.	L 4	12
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**Figure 2**

**OR**





- Q.2 A simply supported beam of span 4 m is subjected to uniformly distributed load of 40 kN/m over entire span. The cross section of beam is T-section which has flange of 200 mm x 40 mm and web of 40 mm x 300 mm. Analyse and draw the maximum flexural stress distribution diagram or shear stress distribution diagram if  $E_s = 200 \text{ GPa}$  L 4 12
- Q.3 At a certain point, the values of normal stresses across two planes at right angles to each other are  $\sigma_x = 100 \text{ MPa}$  and  $\sigma_y = 40 \text{ MPa}$  both tensile and a shear stress  $\tau = 50 \text{ MPa}$ . Analyse either analytically or Mohr's Circle method and find: L 4 12
1. The Principal Stresses and their locations.
  2. Maximum Shear Stresses and their planes.
- Q.4 A cantilever beam of span 4 m is subjected to uniformly distributed load of 20 kN/m over length of 2.5 m from free end. Find the slope and deflection at the free end of the beam if  $E = 200 \text{ GPa}$  and  $I = 100 \times 10^6 \text{ mm}^4$ . Use either Macaulay's method or Conjugate Beam method. L 4 12
- Q.5 A hollow circular column of height 4 m has 60 mm external diameter and 40 mm internal diameter which is fixed at both ends. Find the ratio of Euler's Load and Rankine's Load carrying capacity of the column if  $E = 200 \text{ GPa}$ ,  $\sigma_c = 320 \text{ MPa}$  and  $a = 1/7500$  L 4 12
- Q.6 Write with neat diagram, maximum principal stress theory. Also, write the limitations and applications of this theory. L 4 12

End

