

FACULTY OF ENGINEERING

B.E. 2/4 (M/P/AE) First Semester (Suppl.) Examination, June/July 2011

MECHANICS OF MATERIALS

Time : Three Hours]

[Maximum Marks : 75

Note :— Answer ALL questions from Part A. Answer any FIVE questions from Part B.

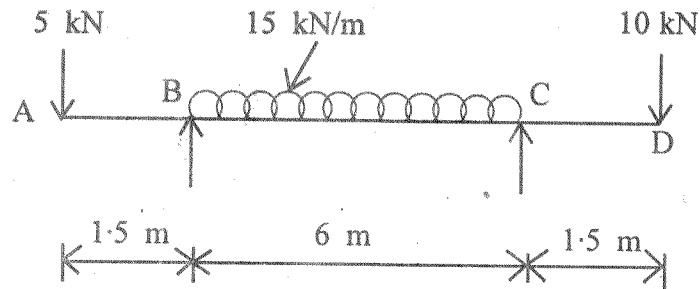
PART—A (Marks : 25)

1. Differentiate between strength and stiffness. 3
2. Write three basic assumptions made in simple theory of bending. 3
3. When a shaft of diameter d is subjected to bending moment M and a torque T , the equivalent torque is given by _____. 3
4. At a certain point in an elastic material, normal stress of 128 MN/m^2 (tension) and 100 MN/m^2 (Compression) are acting on planes at right angles to each other. What is the maximum shear stress in the material if it is subjected to major principal stress of 160 MN/m^2 ? 3
5. What are Lamé's constants ? Explain briefly. 3
6. For what angle θ , will the normal stress be maximum ? 2
7. In the case of T-section, the maximum bending stress will occur at (a) Neutral axis (b) extreme fibre in the range (c) extreme fibre in the web (d) junction of web and flange. 2
8. Write the relation between shear force, bending moment and rate of loading. 2
9. Define terms Ductility and Malleability. 2
10. Write secant formula for eccentrically loaded column. 2

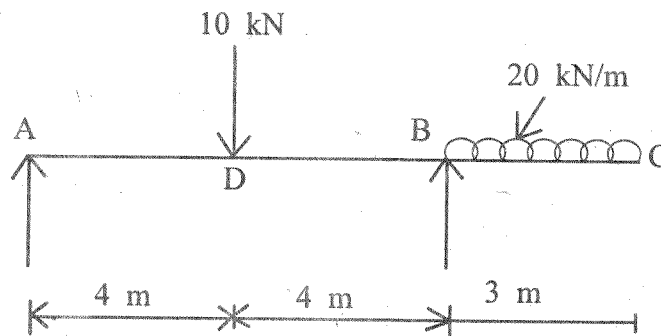
PART—B (Marks : 50)

11. (a) Derive the relationship between modulus of elasticity (E) and bulk modulus (K). 7
- (b) Draw stress strain curve for a mild steel subjected to tension test. Indicate salient point therein. 3

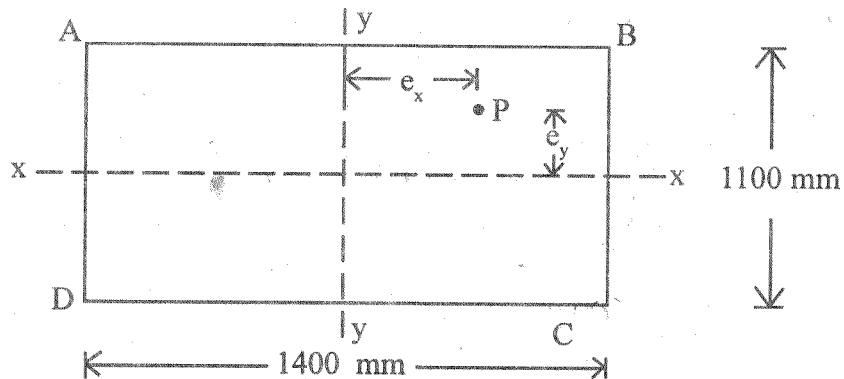
12. Draw BMD and SFD for the following overhanging beam indicating values at salient points. 10



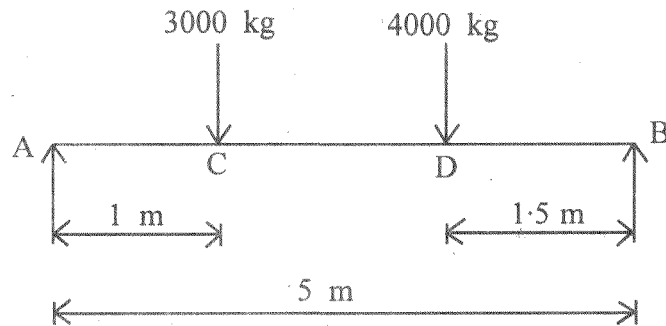
13. Determine slope and deflection at D and C for the overhanging beam shown below : 10



14. The cross-section of Joist is a T-section $80 \text{ mm} \times 130 \text{ mm} \times 10 \text{ mm}$ with the 80 mm side horizontal. Find the maximum intensity of shear stress and sketch the distribution of stress across the section if it has to resist a shear force of 6 tonnes. 10
15. A rectangular column is subjected to a compressive load of 550 kN as shown in figure. Find the stress intensities at four corners of the column. P is the point of application of load and $e_x = 250 \text{ mm}$, $e_y = 250 \text{ mm}$. 10



16. Find the position and amount of Maximum deflection in the below shown beam.
 $I_x = 7332 \text{ cm}^4$, $E_x = 2 \times 10^6 \text{ kg/cm}^2$. 10



17. (a) At a certain cross section of a shaft 100 mm in diameter there is a bending moment of 5000 kN-mm and twisting moment of 7500 kN-mm. Calculate the maximum direct stress induced in the section and specify the position of plane on which it acts. 8
(b) Differentiate between close coiled and laminated springs. 2