Reg. No. : | | | | | | | | | | |

Question Paper Code: 34104

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Fourth Semester

Civil Engineering

01UCE404 - MECHANICS OF SOLIDS II

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

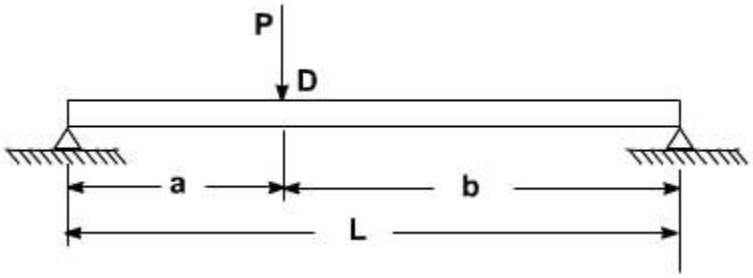
Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. What do you mean by strain energy?
2. State the Castigliano's theorems.
3. Write the various types of support conditions.
4. What are the advantages of continuous beam over simply supported beam?
5. Write the formula for deflection of a fixed beam with eccentric point load and uniformly distributed load.
6. What is conjugate beam?
7. Write the expression for finding the crippling load when the both ends of the column are hinged.
8. Write the expression for the determination of circumferential stress or hoop stress in thin cylinder.
9. Define shear center.
10. Define unsymmetrical bending

PART - B (5 x 16 = 80 Marks)

11. (a) (i) Determine the expression for strain energy of the prismatic beam *AB* for the loading as shown in figure below. Take into account only the effect of normal stresses due to bending. *P = 208 kN ; L = 3.6 m = 3600 mm A = 0.9 m; b = 2.7m E = 200 GPa ; I = 104* x 10^8 mm^4 . (11)



(ii) Evaluate the strain energy for the following values of the beam. (5)

Or

(b) A beam simply supported over a span of 3m carries a uniformly distributed load of 20 kN/m over the entire span. Taking EI = 2.25 MNm^2 and using Castiglian's theorem determine the deflection at the center of the beam. (16)

12. (a) A simply supported beam of 16 m effective span 0carries the concentrated loads of 4 kN, 5 kN and 3 kN at distances 3, 7, and 11 m respectively from the left support. Calculate maximum shearing force and bending moment. Draw the S.F and B.M diagrams. (16)

Or

(b) A cantilever of span 2*m* carries an *UDL* of 18 *kN/m*. Determine the slope and deflection at free end of the cantilever. Take *E* = 1 x $10^5 N/mm^2$ and *I* = 2 x 10^7 mm^4. (16)

13. (a) A beam *ABCD* is simply supported at *A* and *D* over a span of *10 m*. The beam carries point loads *60 kN* and *40 kN* at distances *3 m* and *6 m* from the end *A*. Neglecting the weight of the beam. Find the slopes at *A*, *B*, *C* and *D* Also find the deflections at *C* and *D*. Take *I = 12x10*^{8} mm^4 and *E = 200 kN/*mm^2 by using conjugate beam method. (16)

Or

(b) A simply supported beam is carrying a load *W* at the center. Calculate the slopes at its ends and the central deflection, using conjugate beam method. (16)

14. (a) A cylindrical air drum is 2.25 m in diameter with plates 1.2 cm thick. The efficiencies of the longitudinal and circumferential joints are respectively 75% and 40%. If the tensile stress in the plating is to be limited to 120 MN /m^2 find the maximum safe air pressure. (16)

Or

(b) A thin walled special vessel having a diameter of *1.5 m* is made of steel plates of uniform thickness. It is fitted with water which is pumped on until the pressure is *1.75 N/mm*^{2}. After the pumping has been completed a relief valve fitted to the vessel is opened and water is allowed to escape until the pressure falls to atmospheric. If the volume of water which escapes is *3500 cc* determine the thickness of the plates. Take $K = 2x10^3$ *N/mm*^{2}, $E = 2x10^5$*N/mm*^{2} and poisson's ratio = 0.286. (16)

15. (a) Find the thickness of the metal necessary for a steel cylindrical shell of internal diameter 200*mm* to withstand an internal pressure of 50 *N/mm*^{2}. The maximum hoop stress in the section is not to exceed 150 *N/mm*^{2}. (16)

Or

(b) A 40 mm x 40 mm x 5 mm angle is used as a simply supported beam over a span of 2.4 m. It carries a load of 200 N along the vertical axis passing through the centroid of the section. Determine the resulting bending stresses on the outer corner of the section, along the middle section of the beam. (16)