



14. a) Discuss the concept of ellipse of stress with a neat sketch. [3]  
 b) A piece of material is subjected to tensile stresses of  $60\text{N/mm}^2$  and  $30\text{N/mm}^2$  at right angles to each other. Find the stresses on a plane the normal of which makes an angle of  $50^\circ$  with the  $60\text{N/mm}^2$  stress. [7]
15. a) Explain the difference in the behavior of thin and thick cylindrical shells. [3]  
 b) A cylindrical shell 3m long, 1m in internal dia. is subjected to an internal pressure of  $20\text{N/mm}^2$ . Calculate the thickness of metal required if the permissible stress is not to exceed  $650\text{N/mm}^2$ . Calculate the changes in dimensions of the shell if  $E = 2 \times 10^5\text{N/mm}^2$  and Poisson's ratio ( $\mu$ ) = 0.25. [7]
16. a) Draw SFD and BMD for a cantilever whose half span from fixed support is loaded with a uniformly distributed load of w/unit run. [4]  
 b) The x, y and z axes are oriented along the length, width and thickness of a rectangular block  $200 \times 120 \times 100\text{mm}$ . It is subjected to axial forces in the 3-directions:  
 $P_x = 120\text{kN}$  (tensile)       $P_y = 75\text{kN}$  (tensile)       $P_z = 100\text{kN}$  (compressive)  
 Calculate the stresses and strains in the 3 directions, volumetric strain and change in volume, taking modulus of elasticity =  $2 \times 10^5\text{N/mm}^2$  and Poisson's ratio ( $\mu$ ) = 0.25 [6]
17. Answer any *two* of the following:  
 a) A rectangular strut is 200mm wide 150mm thick, it carries a load of 60kN at an eccentricity of 20mm in a plane bisecting the thickness. Find the maximum and minimum intensities of stress in the section. [5]  
 b) A pipe of 200mm internal diameter and 100mm thickness contains a fluid at a pressure of  $10\text{N/mm}^2$ . Find the maximum and minimum hoop stress across the section. [5]  
 c) Write a short note on the construction of Mohr's circle for two mutually perpendicular like stresses  $\sigma_1$  and  $\sigma_2$  acting on a body. [5]

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