1127

Code : 9ME-31

Register Number | | | | | | | |

III Semester Diploma Examination, Nov./Dec., 2014

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

Time : 3 Hours] **[Max. Marks : 100**

Note : (i) Section – **I** is *compulsory*.
(ii) Answer any **two** full questions each from Sections – **II** & **III** & **IV**.
(iii) Assume any missing data.

SECTION – I

1. (a) Fill in the blanks : **5**

(i) Kinetics which deals with the bodies in motion due to the application of _____.

(ii) The forces whose links of action lie on the same line, are known as _____.

(iii) For thick shells, the hoop stress is _____ at the outer surface.

(iv) The value of poisson's ratio is always _____ unity.

(v) The bending moment at the free end of a cantilever is always _____.

(b) Define and derive parallelogram law of forces. **5**

SECTION – II

2. (a) Define lami's theorem. Explain with diagram. **5**

(b) The following forces act at a point : **10**

(i) 25 N, inclined at 25° towards north east

(ii) 30 N towards north

(iii) 32 N towards north west

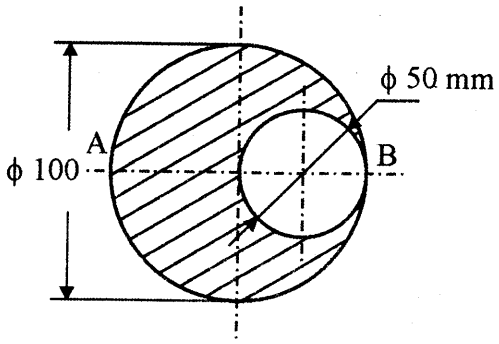
(iv) 45 N inclined 40° towards south of west

Find the magnitude and directions of the resultant for the above system of forces.

[Turn over

3. (a) Explain theorem of perpendicular axis. **5**

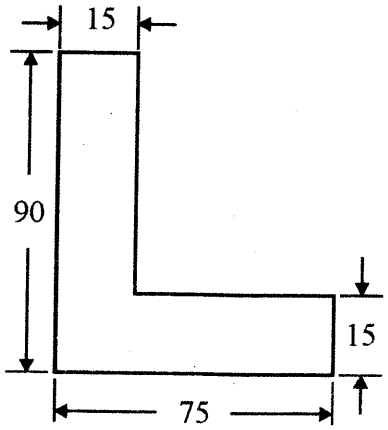
(b) A circular hole 50 mm diameter is cutout from circular disc of 100 mm diameter as shown in fig. Find the centre of gravity of the section, from 'A'. **10**



Note : All dimensions are in mm

4. (a) Explain theorem of parallel axis. **5**

(b) Find the moment of inertia about the centroidal x-x, and y-y axis of the section shown in fig. **10**



Note : All dimensions are in mm.

SECTION – III

5. (a) Define bulk modulus and Poisson's ratio. **5**

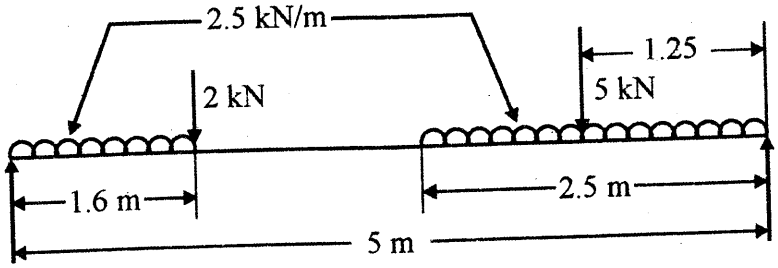
(b) A metal bar of 40 × 40 mm in section is subjected to an axial compression of 450 kN, the reduction in length is 0.4 mm over a gauge length of 180 mm and increase in thickness is 0.05 mm. Find the values of elastic constants. **10**

6. (a) With sketches explain the sign conventions for shear force and bending moment. **5**

(b) A cantilever 2.5 m length is loaded with a uniformly distributed load of 3 kN/m run over a length of 1.75 m from the free end. It also carries a point load of 4 kN at a distance of 0.4 m from the free end. Draw the S.F.D. and B.M.D. of the cantilever beam. **10**

7. (a) Draw SFD and B.M.D. for the simply supported beam, 5 m long is subjected to two point loads of 3 kN and 6 kN, each at distances of 2.25 m and 3.75 m from the left end of beam. **5**

(b) A 5 m long simply supported beam AB, loaded as shown in fig. **10**



Draw the SF and BM Diagrams

SECTION – IV

8. (a) Explain bending stress and mention the assumptions made in the theory of simple bending. **5**

(b) A boiler shell of 2 m dia. is made up of mild steel plates of 20 mm thick. The efficiency of longitudinal joint [η_L] is 70% and efficiency of circumferential joint [η_c] is 65%. Determine the safe pressure in the boiler if the permissible tensile stress in the plate section through the rivets is 100 N/mm^2. Also determine the circumferential stress in the solid plate section and longitudinal stress through the rivets. **10**

9. (a) State the torsion equation and mention the units. **5**

(b) A hallow shaft of diameter ratio 3/6 is required to transmit 400 kW at 120 r.p.m. The maximum torque being 30% greater than the mean. The shear stress is not to exceed 1.5 degrees. Calculate the maximum external diameter, satisfying these conditions. Take C = 75 kN/mm^2. **10**

[Turn over

10. (a) Calculate the strain energy stored in a bar 250 mm long, 40 mm wide and 20 mm thick, when it is subjected to a tensile load of 55 kN. Take $E = 2 \times 10^5$ N/mm^2. **5**

(b) A cylindrical shell 2.5 m long has 1.1 metre internal diameter and 16 mm metal thickness. Calculate the circumferential and longitudinal stresses induced and also changes in the dimensions of the shell, if it is subjected to an internal pressure of 1.6 N/mm^2. Take $E = 2 \times 10^5$ N/mm^2 and Poisson's ratio is 0.3 **10**
