GANPAT UNIVERSITY

B.Tech.First Semester (MC/ME/CIVIL), Examination – November / December: 2010

CI 102 : Mechanics of Solids

Max.Time: 3 Hours   Max. Marks: 70

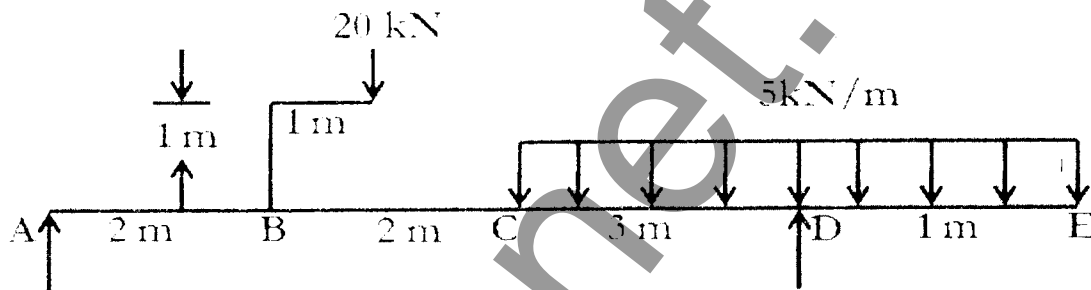Exam. No. of the candidate: _____   Supervisor's dated initial: _____

Instructions: -   (1) Answer to the two sections must be written in separate answer books.
                          (2) Figures to the right indicate full marks.
                          (3) **Assume suitable data if required.**

Section - I

1   (A)   Draw shear force and bending moment diagram for the beam in figure No: 1. Also find   (08)
          point of contra flexure.

(Figure No : 1)

(B)   Explain general relationship between load, shear force and bending moment.   (04)

2   (A)   Find the volumetric strain of rectangular body, subjected to longitudinal force.   (05)

(B)   The following data refer to a mild steel specimen tested in laboratory.   (06)
          Diameter of the specimen =25 mm
          Length of specimen = 300 mm
          Extension under load of 15 KN = 0.045 mm
          Load of yield point= 127.65 KN
          Maximum load=208.60 KN
          Length of specimen after failure = 375 mm
          Neck diameter=17.75 mm
          Determine (I) Young's modulus (II)Yield point stress (III)Ultimate stress
          (IV)Percentage of elongation (V)Percentage reduction in area (VI)Safe stress adopting
          a factor of safety of 2.

OR

2   (A)   Write short note on: (I) Tension test on mild steel.   (04)

(B)   Two vertical rods one of steel and other of copper are rigidly fixed at top and are   (07)
          500 mm apart. Diameter of each bar is 20 mm and length of each bar is 4m. A cross
          bar fixed to the rod at the lower end carries a load of 5000 N such that the cross bar
          remains horizontal. Find the tension in each rod and position of the load on the cross
          bar. Take $E_s=2 \times 10^5$ N/mm^2, $E_c=1 \times 10^5$ N/mm^2.

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3 Attempt any <u>Two</u>:
  (A) Derive an expression for the centre of gravity of plane area using method of moments.
  (B) A beam of inverted T-section of overall depth 100mm, width of the flange is 225mm and thickness of web and flange 25mm. Calculate M.I. about x-x axis.
  (C) A rod has been bent into the shape ABCD as shown in figure No: 2.
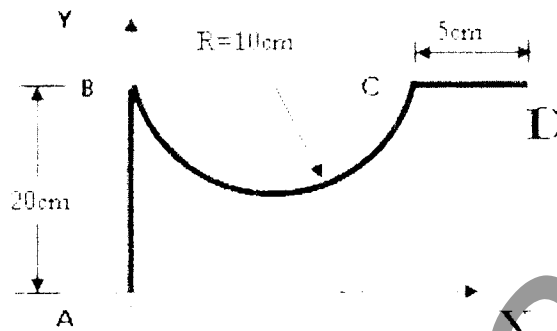
(Figure No : 2)

Section – II

4 (A) Define "reversible machine" and "irreversible machine". Derive an expression for the condition of irreversibility of the machine. (6)
  (B) A machine has a velocity ratio 40. No load effort for this machine is 22.5 N. Effort wasted in friction is 2% of the load raise. Determine (1) The law of the machine (2) The effort required to raise a load of 4500 N. (3) Maximum mechanical advantages and (4) Maximum possible efficiency of this machine. (6)

5 (A) Define :(a) Statics and (b) dynamics. State the difference between fundamental units and derived units. (5)
  (B) The force P1 is of 100N magnitudes. The resultant of forces P1 & unknown force P2 is 100N in magnitude. Find the magnitude and direction of P2 if the resultant force is perpendicular to force P1. (6)

<div align="center">OR</div>

5 (A) Show that if three coplanar forces, acting at a point be in equilibrium, then each force is proportional to the sine of the angle between the other two. (5)
  (B) L, M, N, and O is write in clockwise sense of a square LMNO of 3m side. Forces of 50 N, 60N, 70N, 80N and 100N act along ML, OL, ON, NL, and MN respectively. Find the algebraic sum of the moments of all the forces about the centre point of the square. (6)

6 Attempt any <u>Two</u>: (12)
  (A) State and prove: (I) Parallelogram law of forces and (II) Triangle law of forces
  (B) Derive the relation of acceleration and tension in the string for the motion of two bodies connected by a string and passing over a smooth pulley.
  (C) Define: 'Friction' and 'Limiting friction'. Also explain relation between Angle of repose and angel of friction

<div align="center">"END OF PAPER"</div>