

## GANPAT UNIVERSITY

B.Tech.2<sup>nd</sup> Semester (CE/IT/EC/BM&I), Regular Examination : May/June : 2012

## 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.

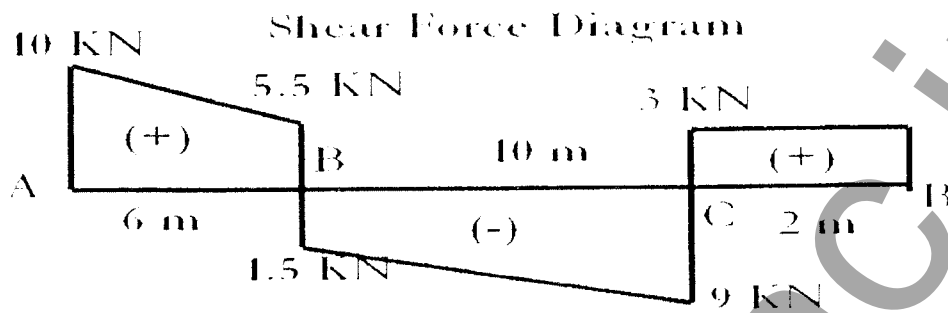
(2) Figures to the right indicate full marks.

(3) Assume suitable data if required.

Section - I

- 1 (A) The following four coplanar forces are acting at a point O as given below. (09)  
(1) 20 N acting  $25^\circ$  North of East, (2) 35 N towards North, (3) 30 N towards North West and (4) 45 N inclined at  $50^\circ$  towards South of West. Determine the resultant in magnitude and direction analytically and graphically.
- (B) What are the different types of load acting on a beam? (04)
- 2 Answer the following question.(Any Two) (10)
- (A) Draw shear force and bending moment diagram for cantilever beam of length 6 meter. Point load of 2 KN acting at 1m and 5 m distance from fix end. U.D.L. load of 2 KN/m acting on 2 meter span at 2 m to 4 m distance from fix end.
- (B) The intensity of loading on a simply support beam of 6 meter span increases gradually from 800 N/meter run at one end to 2000 N/meter run at the other end. Draw shear force and bending moment diagram for given beam. Also find the position and amount of maximum bending moment.

- 2 (C) Find directly from the shear force diagram (I) loading on the beam, (II) bending moment at 2 meter intervals along the beam, (III) position of the support and (IV) reactions at the both supports. Also draw bending moment diagram for the beam and find the position and amount of maximum bending moment.



- 3 (A) Define "couple" and list various characteristics of couple. (04)

OR

- 3 (A) Enlist and explain methods for finding out Centre of Gravity. (04)

- 3 (B) Determine the Centroid of the plane figure with respect to X and Y axis as shown right side figure. (08)

Determine the Centroid of the plane figure with respect to X and Y axis as shown right side figure.

### Section – II

- 4 Answer the following question (12)

- (A) Derive relation between V.R. , M.A. and  $\eta$ .
- (B) Write a short note on types of friction.
- (C) Derive relation between Young modulus and Bulk modulus

- 5 (A) Derive the equation for the tension in the string, when one body is hanging free and the other is lying on a rough horizontal plane (06)
- (B) Differentiate between (a) Kinematics and Kinetics (b) Dynamics and Statics. (06)

OR

- 5 (A) Define 'Lifting machine and derive velocity ratio of Wheel and Differential Axle with neat sketch. (06)
- (B) The law of a machine is  $P=0.040 W + 25 N$ , the machine has a velocity ratio of 45. Calculate (1) M.A., (2) Mechanical efficiency, (c) Effort lost in friction and (d) Load lost in friction. (06)
- 6 (A) State and prove 'Lami's Theorem' (05)
- (B) Two equal heavy sphere of 50 mm radius are in equilibrium within a smooth cup of 150 mm radius as shown in figure below. Show that reaction between the cup and one sphere is doubled than that between two spheres. (06)

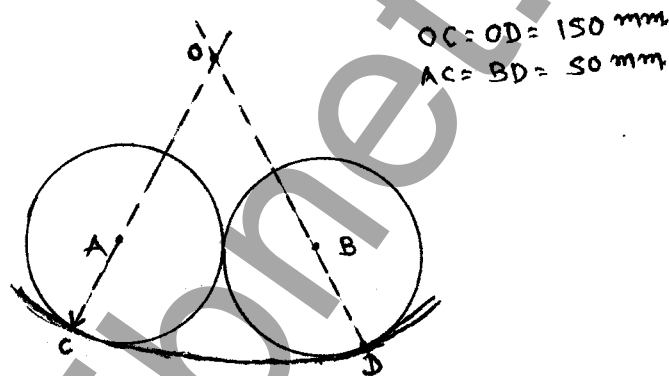


Figure  
OR

- 6 (A) Define 'Thermal stress' and differentiate 'prismatic sections' and 'non prismatic sections'. (05)
- (B) A copper rod of 30 mm diameter is placed inside a steel tube of external diameter of 35 mm and internal diameter 32 mm. The tube and the rod are 400 mm long and connected together at end. Find the value of external load P carried by assemble if stress in steel is limited to  $250 \text{ N/mm}^2$ . Take  $E_s = 200 \text{ KN/mm}^2$  and  $E_c = 100 \text{ KN/mm}^2$ . (06)

"End of Paper"