

# GANPAT UNIVERSITY

B.Tech.2<sup>nd</sup> Semester (CE/IT/EC/BM/MARINE), Regular Examination –May /June : 2013

## 2CI-102 MECHANICS OF SOLIDS

Max.Time: 3 Hours

Max. Marks: 70

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

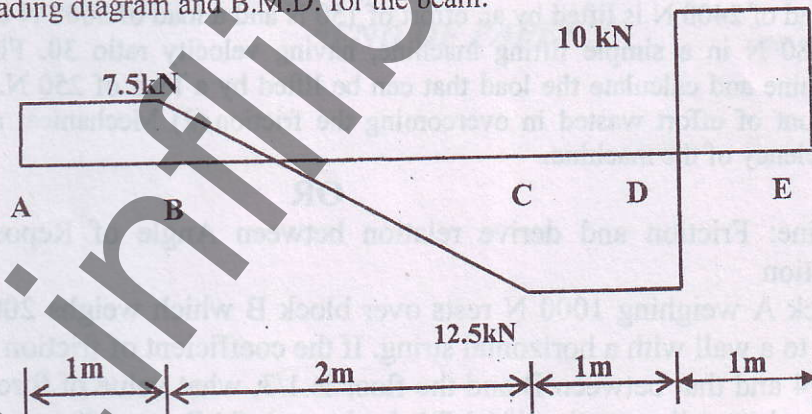
- Instructions: -
- (1) Answer to the two sections must be written in **separate** answer books.
  - (2) Figures to the **right** indicate **full** marks.
  - (3) Assume suitable data if required.

### Section - I

- Q.1 (A) A cantilever having length of 5m is fixed at left side. A point load of 50kN is acting at mid point acting in upward direction, moment of 30 kN-m clockwise at free end and uniformly distributed load of 30kN/m is spread over on 3m length starting from 1m away from fixed end. Draw the shear force and bending moment diagram and Show all the important values. (8)
- (B) What is point of contraflexure? What is its significance? (3)

OR

- Q.1 (A) What is relationship between load, shear force and bending moment? (4)
- (B) A shear force diagram for the beam support at points A & D as shown in Figure below. Draw loading diagram and B.M.D. for the beam. (7)



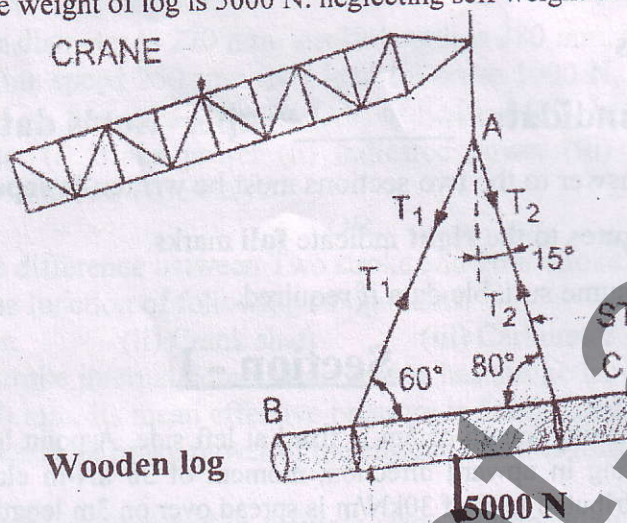
- Q.2 (A) The following four coplanar forces are acting at a point O as given below. (1) 200 N (8)  
inclined at 26° North of East, (2) 120 N inclined at 53° West of North, (3) 50 N inclined at 60° towards West to South and (4) 100 N inclined at 50° towards East to South. Determine the resultant in magnitude and direction analytically and graphically.
- (B) Explain Law of Parallelogram of forces. (4)

OR

- Q.2 (A) Forces  $2\sqrt{3}$ ,  $5\sqrt{3}$  and 2 kN respectively act at one of the angular points of a regular hexagon towards five other angular points. Determine the magnitude and direction of the resultant force. (6)



- Q.2 (B) State and explain Varignon's theorem of moments (6)
- Q.3 (A) Give names of the systems of units. Which is universally accepted system? (3)
- (B) Write a short note on free body diagram. (3)
- (C) A wooden log is lifted a crane using strings as shown in Figure below. Find out tension in each string if the weight of log is 5000 N. neglecting self weight of strings. (6)

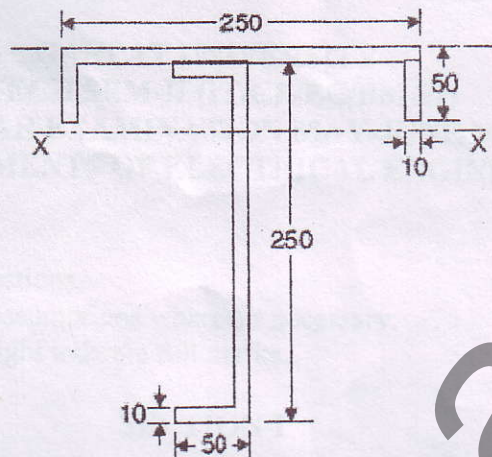


## Section - II

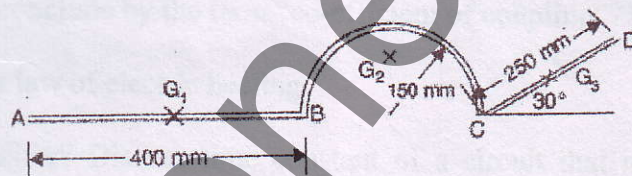
- Q.4 (A) Derive equation for finding out velocity ratio of "Wheel and Differential Axles" with neat sketch. (6)
- (B) A load of 2400 N is lifted by an effort of 150 N and a load of 3000 N is lifted by an effort of 180 N in a simple lifting machine, having velocity ratio 30. Find the law of the machine and calculate the load that can be lifted by a load of 250 N. Find also (1) The amount of effort wasted in overcoming the friction, (2) Mechanical advantage, and (3) Efficiency of the machine. (6)
- OR**
- Q.4 (A) Define: Friction and derive relation between Angle of Repose and Angle of Friction. (6)
- (B) Block A weighing 1000 N rests over block B which weighs 2000 N. Block A is tied to a wall with a horizontal string. If the coefficient of friction between A and B is  $\frac{1}{4}$  and that between B and the floor is  $\frac{1}{3}$ , what value of force P is required to create impending motion if (a) P is horizontal, (b) P acts  $30^\circ$  upwards to horizontal. (6)
- Q.5 (A) Discuss: Stress – Strain Curve of Mild Steel specimen. (5)
- (B) A bar of 25 mm diameter is tested in tension. It is observed that when a load of 60 kN is applied, the extension measured over a gauge length of 200 mm is 0.12 mm and contraction in diameter is 0.0045 mm. Find Poisson's ratio and elastic constants E, G, K. (6)
- OR**
- Q.5 (A) State and prove "Parallel axis theorem" of moment of inertia. (5)



- Q.5 (B) Calculate the moment of inertia about xx of the built-up section shown in Fig (6) below. All members are 10 mm thick.



- Q.6 (A) State and explain theorem I and II of Pappus-Guldinus (6)  
 (B) Find out and Locate the centroid of the uniform wire bent as shown in Fig below. (6)



"END OF PAPER"