GANPAT UNIVERSITY

B. Tech. Sem. I & II   Regular & Remedial   Examination – Nov/Dec : 2016

2 CI 102: ENGINEERING MECHANICS

Max. Time: 3 Hours

Total Marks: 60

Instructions: (1) This Question paper has two sections. Attempt each section in separate answer book.
(2) Figures on right indicate marks.
(3) Be precise and to the point in answering the descriptive questions.

Section – I

1 (A) Explain types of Supports with sketch.   (05)

   (B) Distinguish between (i) Scalar and Vector Quantities (ii) Kinetics and Kinematics   (05)

2 (A) Derive equation for finding out $\bar{X}$ and $\bar{Y}$ for Semi- Circular area by method of integration   (05)

   (B) A coplanar concurrent force system has forces P and 2P and its resultant equal to 2.5P. Find the angle between applied forces and the angle of resultant.   (05)

OR

2 (A) Determine the centroid of the plane area in which a circular part of 20 mm radius, has been removed as shown in figure.   (05)
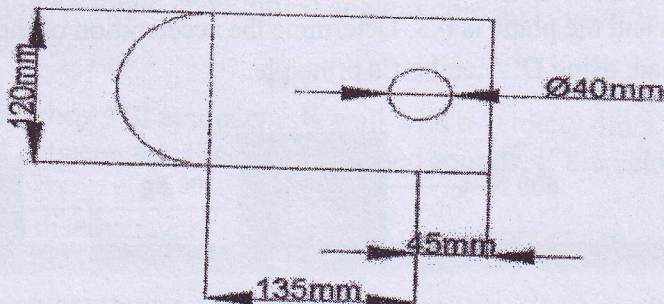
2 (B) State and proof perpendicular axis theorem.   (05)

3 (A) A 4m long ladder has to carry a person of 75kg weight at 3.5m distance from floor, along the length of the ladder. The self-weight of the ladder is 150N. Find the maximum distance of lower end of ladder from vertical wall so that it does not slide. The co-efficient of friction between floor and ladder is 0.3 and that between vertical wall and ladder is 0.2.   (05)
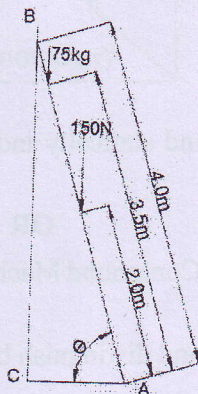
   (B) Determine I_{xx} and I_{yy} of the T section having dimensions of
   (i) Web :20 mm x 80 mm (ii) Top flange : 80 mm x 20 mm   (05)

OR

3 **(A)** State types of friction and define static friction and dynamic friction. (05)

(B) Define resultant force and Prove that a body subjected to equal and opposite parallel forces will not be in equilibrium. (05)

Section – II

4 **(A)** In a double purchase crab winch, numbers of teeth on spur wheels are 80 and 60 and numbers of teeth on pinion wheel are 30 and 40. The effort handle is 400 mm long and diameter of load drum is 200 mm. Load of 300 N and 600 N are lifted by efforts of 25 N and 45 N respectively. Calculate: (I) Velocity Ratio, (II) Law of machine (III) Maximum Efficiency and (IV) Maximum Mechanical Advantage. (05)

(B) Derive equation for finding out velocity ratio of "Single Purchase crab winch" with neat sketch. (05)

5 **(A)** Write short note on "Instantaneous Centre of Rotation". (05)

(B) The crank and connecting rod of a steam engine are 0.60 m and 2.00 m respectively. The crank makes 10 revolution per second. in the clockwise direction. When the crank has turned 30° from the inner dead center, determine: (i) Angular velocity of connecting rod and (ii) Velocity of piston. (05)

OR

5 **(A)** Describe in brief Newton's Law of motions and D' Alembert's Principle. (05)

(B) Two bodies A and B of mass 100 kg and 40 kg are connected by a thread and move along a rough horizontal plane under the action of a force 600 N applied to the first body of mass 100 kg as shown in Figure bellow. The coefficient of friction between the sliding surfaces of the bodies and the plane is 0.3. Determine the acceleration of the two bodies and the tension in the thread, using D' Alembert's principle. (05)
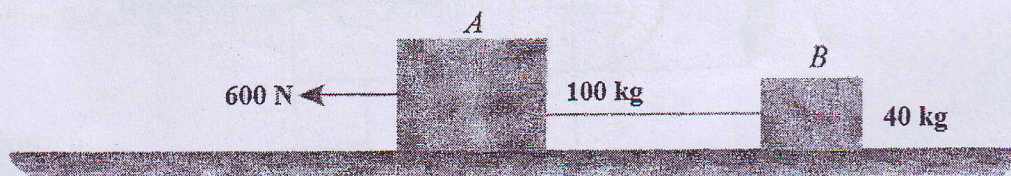
6 **(A)** Calculate the co-ordinates of the centroid of the plate shown in the figure. (05)
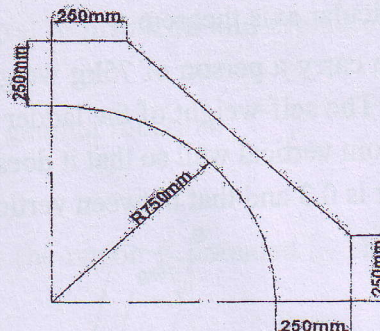
(B) What is statically determinate and statically indeterminate structure, explain with suitable example. (05)

OR

6 **(A)** Define: (i) Simple Machine, (ii) Compound Machine, and derive equation for Maximum MA and Maximum Efficiency. (05)

(B) Enlist characteristics of Couple and distinguish between Moment and Couple (05)

" END OF PAPER"