

Date: 15/05/2017

B.TECH SEMI I & II (ALL BRANCHES)
REGULAR & REMEDIAL EXAMINATION (NEW CBCS) APRIL-JUNE-2017
2CI102 Engineering Mechanics

Time: 3 Hours

Max Marks: 60

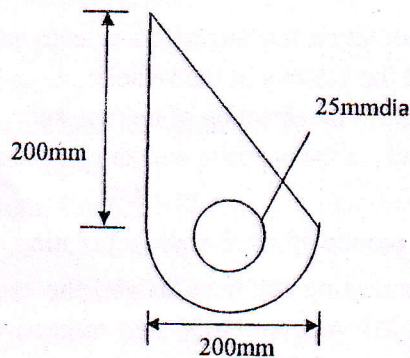
- Instructions :- (1) Answer to the two sections must be written in separate answer books.
(2) Figures to the right indicate full marks.
(3) Assume suitable data if required.

SECTION - I

- Q1(A) The sum of two concurrent forces P and Q is 270 N and their resultant is 180 N. The angle between the force P and resultant R is 90° . Find the magnitude of each force and angle between them. (5)
- (B) Calculate the centroid of angle section ISA 90 x 60 x 6 mm keeping longer leg vertical. (5)

OR

- Q1(A) Six forces 2 kN, 3 kN, 4 kN, 5 kN, 6 kN, 7 kN respectively act outwards from the center of regular hexagon towards its corner. Determine the magnitude and direction of the resultant. (5)
- (B) Find the centroid of lamina as shown in figure (5)

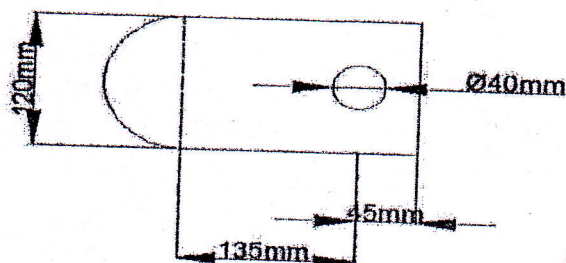


- Q2(A) Find centroid of a wire making equilateral triangle of 4 cm side. (5)
- (B) A ladder 6 m long rests on horizontal ground and leans against a smooth vertical wall at an angle of 20° with the vertical. Its weight is 1000 N acting at its middle. It is on the point of sliding when a man weighting 500 N stands on it at a distance 2.2 m along the ladder from foot of the ladder. Calculate the coefficient of friction. (5)

OR

- Q2(A) Calculate I_{xx} and I_{yy} for a T- section with a flange and web each of size 60 mm x 20 mm. (5)
- (B) An electric lamp in street is having 50 N weight is suspended by two wires of 4 m and 3 m length. The horizontal distances between two fixed points are 5 m from which two wires are suspended. Find out tension in both wires. (5)

- Q3(A) Explain Parallelogram law of forces with neat sketch and derivation. (5)
- (B) Determine the centroid of the plane area in which a circular part of 20 mm radius, has been removed as shown in figure. (5)



SECTION – II

Q4(A) Derive equation for finding out velocity ratio of “Differential axle and wheel” with neat sketch. (5)

(B) In a double purchase crab winch, numbers of teeth on spur wheels are 70 and 50 and numbers of teeth on pinion wheel are 30 and 40. The effort handle is 250 mm long and diameter of load drum is 120 mm. Load of 250 N and 500 N are lifted by efforts of 25 N and 45 N respectively. Calculate: (5)

(i) Velocity Ratio, (ii) Law of machine (iii) Maximum Efficiency and (iv) Maximum Mechanical Advantage

OR

Q4(A) What is meant by reversible machine? Prove that a machine is reversible if its efficiency is more than 50%. (5)

(B) In lifting machine an effort of 15 N raised a load of 770N. What is the mechanical advantage? Final velocity ratio if the efficiency at this load is 60%. If on the machine an effort of 25 N raised a load of 1320 N, what is the efficiency? What will be the effort required to raise a load of 500 N? Calculate : (5)

(i) Maximum M.A. (ii) Maximum Efficiency.

Q5(A) Write and explain the equations of Rectilinear Motion. (5)

(B) A vehicle, of mass 400 kg, is moving with a velocity of 20 m/s. A force of 200 N acts on it for 3 minutes. Find the velocity of the vehicle: (5)

(i) When the force acts in the direction of motion, and
(ii) When the force acts in the opposite direction of the motion.

OR

Q5(A) Describe combined motion of rotation and translation. With suitable example. (5)

(B) In a crank and connecting rod mechanism, the radius of crank and length of the connecting rod are 250 mm and 1600 mm respectively. The crank is rotating at 150 r.p.m. Find the velocity of the piston, when the crank is at an angle of 45° , with the horizontal. (5)

Q6(A) What is ‘Instantaneous Centre’. Write down the steps to locate ‘ Instantaneous Centre’ (5)

(B) Explain the following terms (Any Two) (5)

(i) State D’ Alembert’s Principle.
(ii) Linear Motion and Rotational Motion.
(iii) Centroidal and Non Centroidal Rotation

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