

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 1287

Roll No.

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B. Tech.**(Semester II) Even Semester Theory Examination, 2012-13****ENGINEERING MECHANICS****Time : 3 Hours]****[Total Marks : 100****Note :** Attempt questions from all Sections as per instructions.**Section-A**Attempt *all* parts of this question. Each part carries 2 marks.

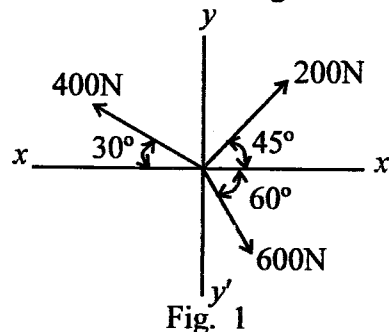
2×10=20

1. (a) State the principle of transmissibility of forces.
- (b) Write the general conditions for equilibrium of a particle.
- (c) State Varignon's theorem.
- (d) List any four engineering applications of friction.
- (e) Define centre of gravity and centroid.
- (f) State parallel axis theorem.
- (g) A body is moving with a velocity of 4 m/s. After 5 seconds the velocity of the body becomes 10 m/s. Find the acceleration of the body.
- (h) Write the general equations for curvilinear motion.
- (i) State D'Alemberts principle.
- (j) State the principle of virtual work.

Section-BAttempt any *three* parts of this question. Each part carries 10 marks.

10×3=30

2. (a) (i) Two concurrent forces of 12 N and 18 N are acting at an angle of 60°. Find the resultant force.
- (ii) Three coplanar concurrent forces are acting at a point as shown in Fig. 1. Determine the resultant in magnitude and direction.



(1)

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- (b) A beam AB of span 10 m loaded as shown in Fig. 2. Determine the reactions at A and B .

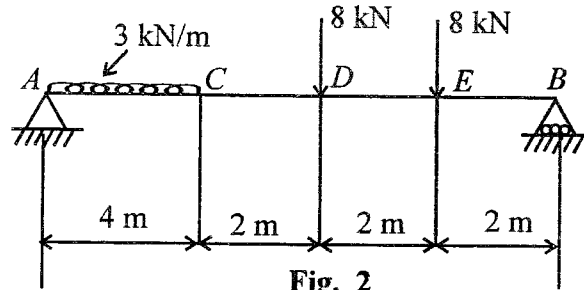


Fig. 2

- (c) Locate the centroid of the lamina shown in Fig. 3.

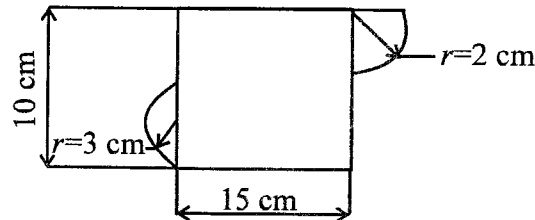


Fig. 3

- (d) A car starts from rest and uniformly accelerated to speed of 20 km per hour over a distance of 200 m. Calculate the acceleration and time taken. If further acceleration raises the speed to 50 km per hour in 8 seconds, find the acceleration and the further distance moved.
- (e) Fig. 4 shows a body of weight 300 N on a smooth horizontal plane is attached by a string to a 30 N weight, which hangs vertically. Find the acceleration of the system and the tension in the string.

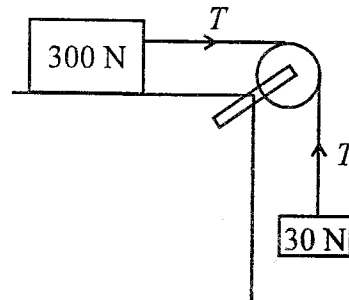


Fig. 4

Section-C

Attempt *all* questions of this Section. Each question carries 10 marks. $10 \times 5 = 50$

3. Attempt any *one* part :

- (a) An electric light fixture weighing 150 N hangs from a point C , by two strings AC and BC as shown in Fig. 5. Determine the forces in the strings AC and BC .

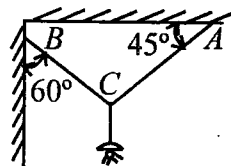


Fig. 5

- (b) A smooth sphere of weight W is supported by a string fastened to a point A on the smooth vertical wall, the other end is in contact with point B on the wall as shown in Fig. If the length of the string AC is equal to the radius of the sphere, find the tension in the string and reaction of the wall.

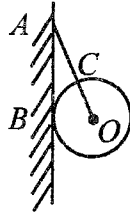


Fig. 6

4. Attempt any one part :

- (a) Block 2 rests on block 1 and is attached by horizontal rope AB on the wall as shown in Fig. 7. What force P is necessary to cause motion of the block 1 to impend? The coefficient of friction between the blocks is $1/4$ and between the floor and block 1 is $1/3$. Mass of the blocks 1 and 2 are 14 kg and 9 kg respectively.

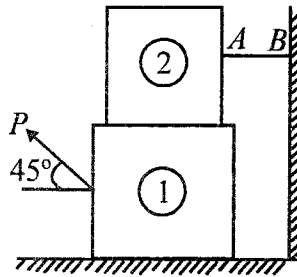


Fig. 7

- (b) Determine the magnitude and nature of forces in all members of the truss shown in Fig. 8.

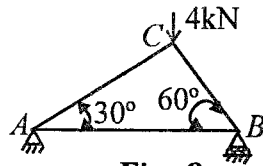


Fig. 8

5. Attempt any one part :

- (a) Find the moment of inertia of I-section shown in Fig. 9, about its centroidal axes.

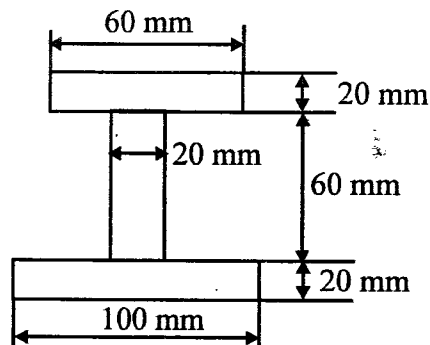


Fig. 9

- (b) Calculate the mass moment of inertia of the body shown in Fig. 10, with respect to vertical geometrical axis. Assume density of cone and cylinder are 6500 Kg/m^3 and 7850 kg/m^3 respectively.

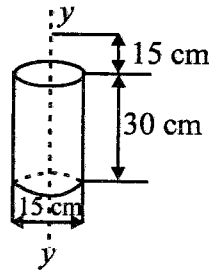


Fig. 10

6. Attempt any one part :

- (a) A particle moves along a straight line with variable acceleration. If the displacement is measured in m and given by relations in terms of time taken t ,
 $S = 3t^3 + 2t^2 + 7t + 3$.
 Determine :
 (i) the velocity of the particle at start and after 3 seconds.
 (ii) the acceleration of the particle at start and after 3 seconds.
- (b) A bar AB of length 1.2 m slides in xy plane as shown in Fig. 11 the velocity of the point A is 5 m/s towards right. Determine :
 (i) the angular velocity of the bar
 (ii) the velocity of the end B and
 (iii) the velocity of the midpoint of the bar at the instant when the axis of the bar makes an angle of 30° with the horizontal.

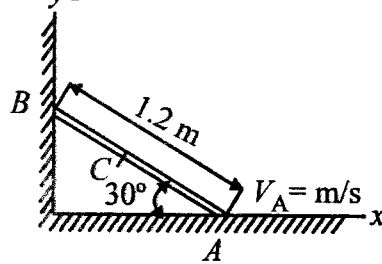


Fig. 11

7. Attempt any one part :

- (a) A block of mass 10 kg rests on a horizontal plane as shown in Fig. 12. Find the magnitude of the force P , required to move the block at an acceleration of 2 m/s^2 towards right. Take the coefficient of friction between the block and the plane is 0.25.

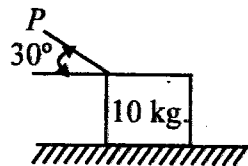


Fig. 12

- (b) A train moving at 40 km/hour is hit by a stone thrown at right angles to it with a velocity of 12 km/hr. Find the velocity and the direction with which the stone hit a person travelling in the train.