Printed Pages : 7

BT-103

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

PAPER ID : **154103**

Roll No.

B. Tech.

(SEM. I) (ODD SEM.) CARRYOVER THEORY EXAMINATION, 2014-15

ENGINEERING MECHANICS

Time : **3** Hours] [Total Marks : **100**

Note : (1) Attempt **all** Questions.
(2) **All** questions carry equal marks.

Note : Attempt question from each Section as per directions.

SECTION – A

Note : Attempt **all** parts of this question. Each part carries **2** marks. **10×2=20**

1. (a) Define and explain concurrent and non-concurrent force system.
(b) Explain Lami's theorem.
(c) Define angle of friction.
(d) Explain Columb's law of friction.
(e) List three types of supports.
(f) State the parallel axis theorem.
(g) Define work energy principle.

(h) Define mechanical advantage and velocity ratio.

(i) Explain difference between centroid and center of gravity.

(j) Define general plane motion.

SECTION – B

Note : Attempt any **three** parts of this question. **10×3=30**
Each part carries **10** marks.

2. (a) (i) Four forces are acting at a point a shown in fig.1, determine the magnitude and direction of resultant.

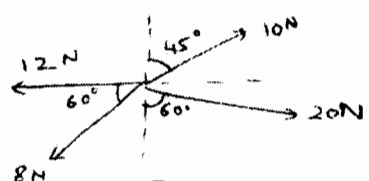

Fig 1

(ii) A roller of 10 KN rests on a smooth horizontal floor and is connected to the floor by bar AC as shown in fig. 2. Determine the force in bar AC and reaction from floor.

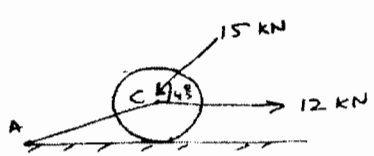

Fig 2

(b) Determine the reaction at supports A and B of beam loaded shown in Fig. 3.

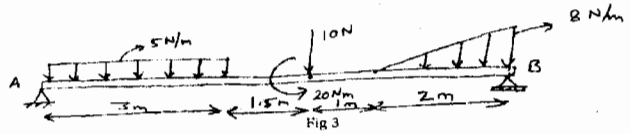

Fig 3

(c) Prove that centre of gravity of hemisphere lies at 3r/8 from the base.

(d) A particle moving along a line has an acceleration given by $a = 2v^{1/2}$ where v is the velocity in m/s. At t = 4 seconds its velocity is 36 m/s and its displacement is 72m. Find the displacement and acceleration of particle at t = 6 seconds.

(e) Find the acceleration of block B when it falls through a height of 5m. If coefficient of friction between the block A and horizontal surface is 0.3. The mass of block A is 25 kg and mass of block B is 10 kg (Fig 4).

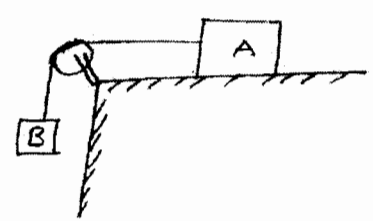

Fig 4

SECTION – C

Note : Attempt **all** parts of this question. Each part carries **10** marks. **10×5=50**

3. Refer to the system of cylinders arranged as shown in Fig 5. The cylinders A and B weigh 1000 N each and weight of cylinder C is 2000 N. Determine the forces exerted at the contact points.

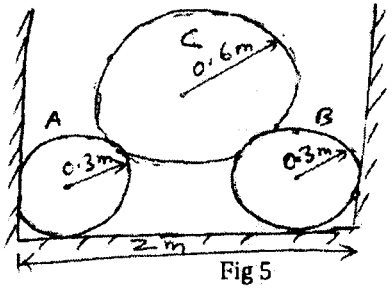

Fig 5

OR

A system of connected flexible cables is supporting two vertical forces of 300N and 400N as shown in Fig 6. Calculate the various forces in various segments of cable.

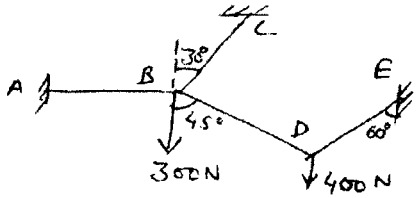

Fig 6

4. The ladder is 6m long and is supported by horizontal floor and vertical wall. The coefficient of friction between the floor and ladder is 0.4 and between wall and ladder is 0.25. Weight of ladder is 200N. The ladder supports a vertical load of 900N at a point which is at a distance 1m from top of ladder. Determine the least value of angle of inclination of ladder with floor at which ladder may be placed without slipping.

OR

Determine the forces in various members of truss by method of joints. (Fig 7)

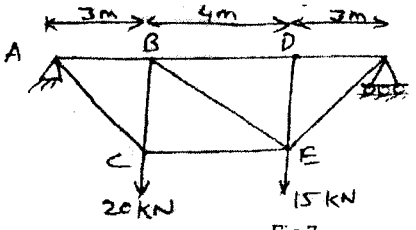

Fig 7

5. Calculate the moment of inertia of section about the centroidal axis (Fig 8).

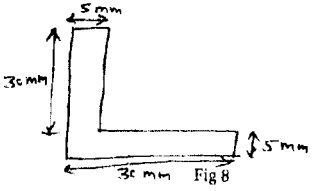

Fig 8

Determine the mass moment of inertia of a circular disc of radus R and thickness t about the centroidal axis.

6. A stone dropped into a well is heard to strike the water in 4 seconds. Find the depth of the well, assuming the velocity of sound to be 335 m/sec.
(take g = 9.81m/sec^2)

OR

A cylinder of diameter 1 m rolls without slipping along a horizontal plane AB. Its centre has a uniform velocity of 20m/sec. find the velocity of the points E and F on the circumference of the cylinder shown in Fig 9

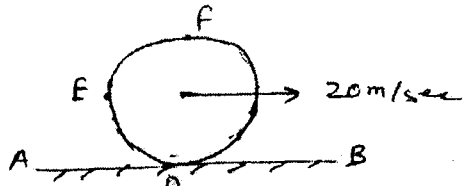

Fig 9

7. Determine the reaction at A and B developed in simple supported beam as shown in Fig 10 (by using principle of virtual work)

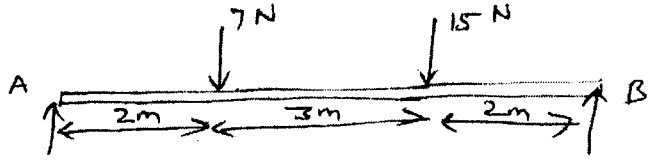

Fig 10

OR

A homogeneous cylinder of mass 50kg and 0.5 m in radius is having initial velocity of 6 m/s down a 30° inclined plane. Calculate the velocity of cylinder when it has reached 10m down the plain from starting point. It may be presumed that the cylinder rolls without sliding. (Fig 11)

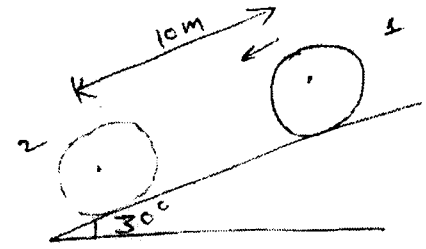

Fig 11