16006(J)   J-16

B. Tech 2nd Semester Examination

Engineering Mechanics (CBS)

ME-101

Time : 3 Hours   **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt one Question from each section ABCD. Question 9 section E is compulsory.

SECTION - A

1. A smooth sphere of weight 'W' is supported in contact with a smooth vertical wall by a string fastened to a point on its surface, the end being attached to a point on the wall. If the length of the string is equal to the radius of sphere, find tensions in the string and reaction on the wall.   (12)

2. A beam with hinged supports and roller support is subjected to a force as shown in fig. 1. Determine the support reaction.
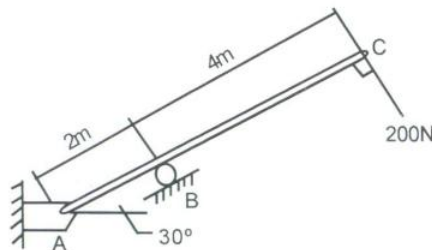

Fig. 1   (12)

[P.T.O.]

SECTION - B

3. Find the position of centre of gravity of the plane lamina in the form of a quarter of an ellipse shown in figure 2.   (12)
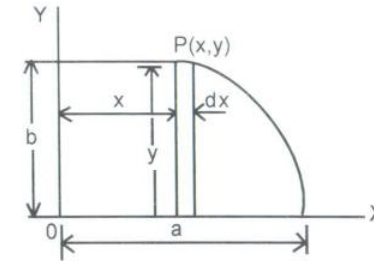

Fig. 2

4. A uniform ladder 3 m long weigh 180 N. It is placed against a wall making an angle of 60° with the floor as shown in figure 3. The coefficient of friction between the wall and ladder is 0.25 and that between the floor and ladder is 0.35. The ladder in addition to its own weight has to support a man weighing 900 N, at its top. Calculate:

(i)   The horizontal force P to be applied to the ladder at the floor level to prevent slipping.

(ii)   If the force P is not applied what should be the minimum inclination of the ladder with the horizontal so that there is no slipping of it with the man at its top?   (12)
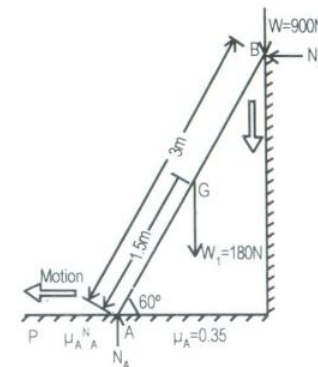

Fig. 3

SECTION - C

5. The Figure 4 shows a truss of 15 m span loaded as shown below. Find the forces in the members of truss by the method of joints.   (12)
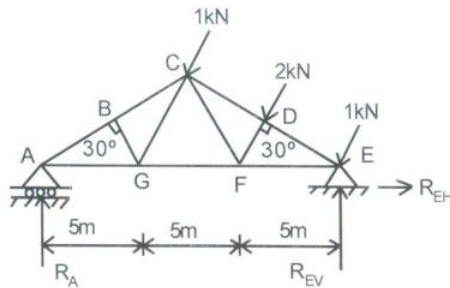

Fig. 4

6. Draw SFD and BMD of Cantilever Beam subjected to UDL over half of its span.   (12)

SECTION - D

7. Two trains A and B leave the same station on parallel lines. A starts with a uniform acceleration of 0.15 m/s^2 and attains a speed of 24 km/hour when the steam is reduced to keep speed constant. B leaves 40 seconds after with uniform acceleration of 0.30 m/s^2 to attain a maximum speed of 48 km/hour. When will B overtake A?   (12)

8. A locomotive draws a train at mass 400 Tonnes, including its own mass, on a level ground with a uniform acceleration, until it acquires a velocity of 54 km/hour in 5 minutes. If the frictional resistance is 40 Newtons/Tonnes of mass and the air resistance varies with the square of the velocity, find the power of the engine. Take air resistance as 500 Newtons at 18 km/hour.   (12)

[P.T.O.]

SECTION - E

9. Explain the following terms:

(i)	Law of Motion	(ii)	Couple
(iii)	Momentum	(iv)	Scalar Quantity
(v)	Angle of friction	(vi)	Radius of Gyration
(vii)	Truss	(viii)	Bending Moment
(ix)	D'almbert Principle	(x)	Impulse
(xi)	Law of Friction	(xii)	Free body diagram

(12×1=12)