Code No. 7

FACULTY OF ENGINEERING

B.E. I – Year (Backlog) Examination, December 2017

Subject: Engineering Mechanics

Time: 3 Hours **Max.Marks: 75**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (25 Marks)

1 Write the static equilibrium equations for co-planar force system. 3

2 Explain the term 'Free Body Diagram' with an example. 2

3 The component of a force 3i +5k along a line 4j + 3k is:_____ 3

4 Define the terms angle of friction and cone of friction. 2

5 Write whether the following statement are true or false. 3
   a) The reactions at supports of a beam will be considered as internal forces for drawing its free body diagram.
   b) The frictional resistances in rolling are lesser than static friction.
   c) Parallel axes theorem is $I_{cg} = I_{xx} + Ah$ with usual notation.

6 The centroid of a triangular section of base 'b' and height 'h' from its base is _____. 2

7 The motion of a particle is given by the equations, $x = t^3-15t^2 - 20$, where x is displacement in meters and t is in sec. determine the acceleration of particle after 4 sec. 3

8 Explain briefly with an example, about general plane motion. 2

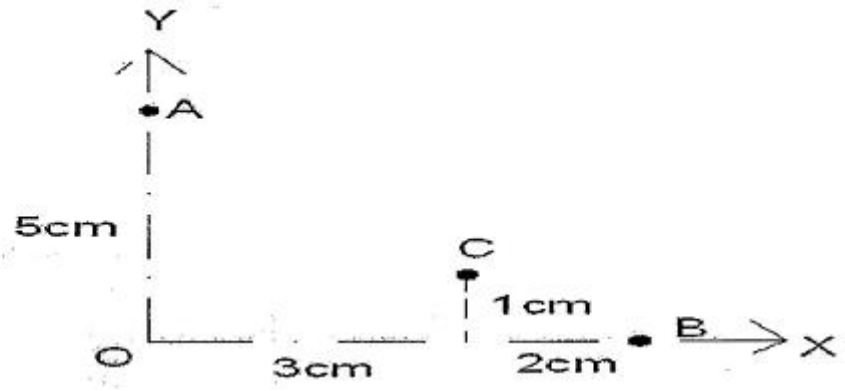
9 Determine the work done in pulling a block of wood weighing 100 kN for a length of 10 m up on a smooth inclined plane which makes 30^o with the horizontal. 3

10 Define the coefficient of restitution. 2

PART – B (5x10 = 50 Marks)

11 a) In Fig. 1. a force P passing through C produces a clockwise moment of 600 N-Cm about 'A' and a counterclockwise moment of 300 N-Cm about 'B'. Determine the moment of P about 'O'. 5

Fig.1.



b) Find the resultant for concurrent co-planar force system shown in Fig. 2. 5

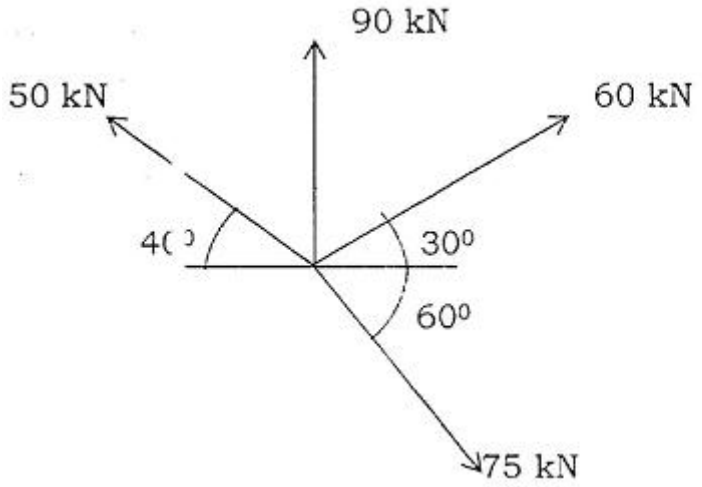


Fig.2.

12 For the system shown in Fig. 3, the force multiplier of P acting from A to E is Pm = 100 N/m. Determine the following. 5+5

a) Component of force P along AC.

b) Moment of P about C.

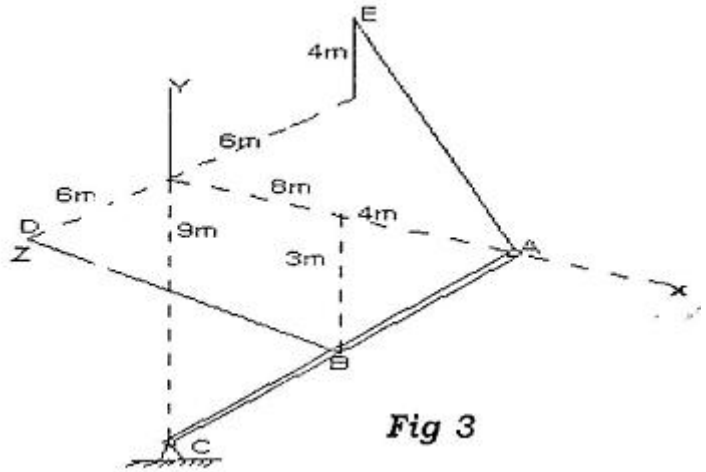


Fig 3

13 A 100 N cylinder shown in Fog. 4 is held at rest by a weight 'P' suspended from chord wrapped around the cylinder if the slipping impends between the cylinder and the inclined, determine the value of 'P' and also the co-efficient of friction. 10

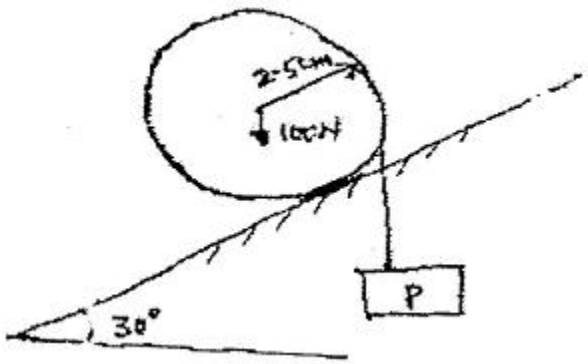


Fig · 4

14 a) Find the coordinates of centroid of a quarter ellipse shown in Fig. 5, Using direct integration. 5

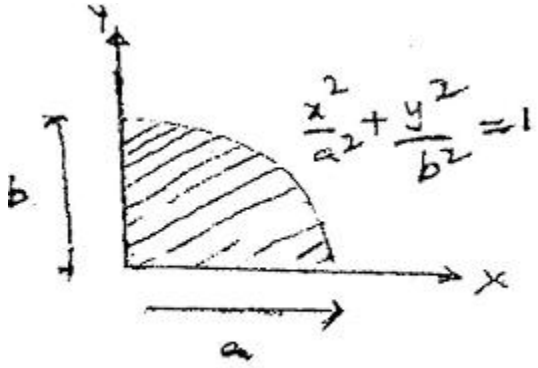


Fig .5

b) Determine the centre of gravity of a solid hemisphere of radius 'R', from its base circle. 5

15 a) Derive from first principles the moment of inertia of a right angled triangle about the base. 5

b) Calculate the moment of inertia of T-section shown in Fig. 6, below, about centroidal X-axis. 5

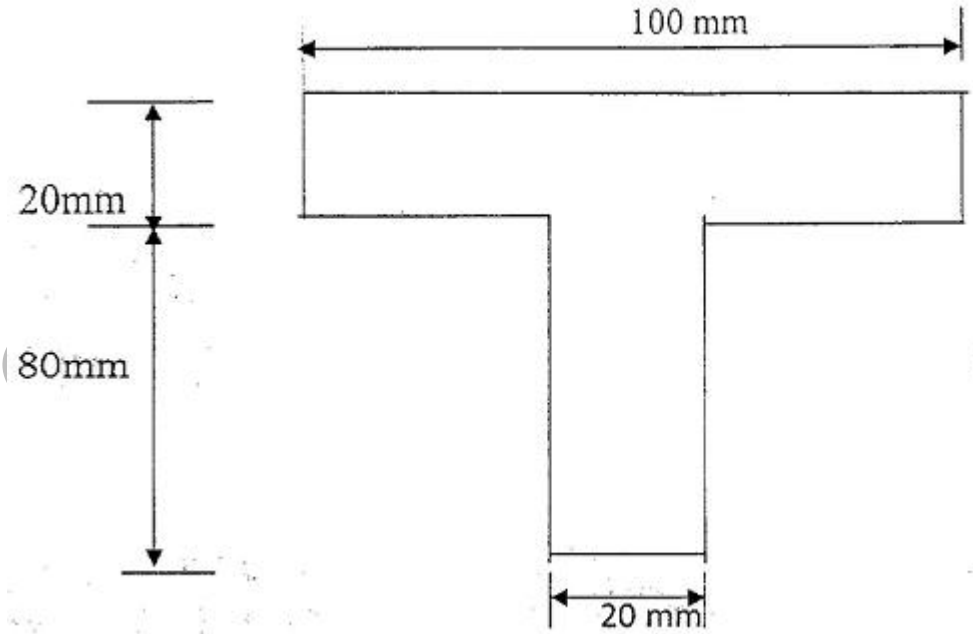


FIG 6

16 a) State D'Alembert principle. 3

b) The location of a particle defined as $r = 5 + 7t^2$ and $\theta = 6 + 3t^2$. Determine the magnitude of velocity and the accelerations of the particle at t = 4 sec. 7

17 a) Derive Work Energy Equation for translation. 3

b) The system has a rightward velocity of 10 m/s. Determine the constant value of P that give it a leftward velocity of 20 m/s in a time interval of 20 sec. Take weights of connected blocks weights of 200 N, 100 N and 400 N from left to right as shown in Fig. 7. 7

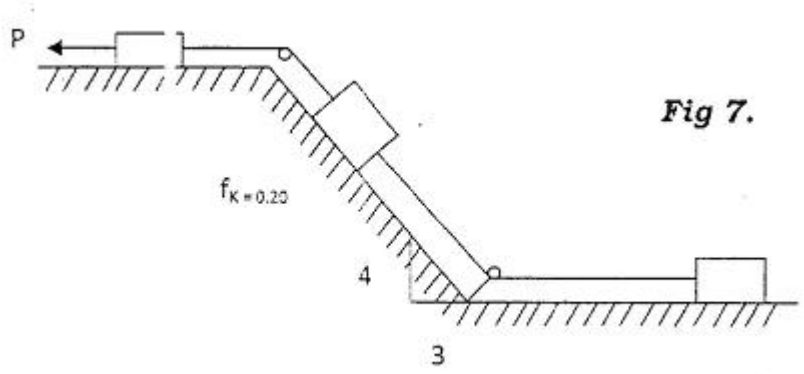


Fig 7.

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Code No. 12

FACULTY OF ENGINEERING

B.E. I – Semester (Main & Backlog) Examination, December 2017

Subject: Engineering Mechanics – I

Time: 3 Hours **Max.Marks: 70**

Note: Answer all questions from Part A and any five questions from Part B.

PART – A (10x2 = 20 Marks)

1 What are the characteristic of a force?

2 Find the component of force F = 4i + 5k along a line 3i – 4j.

3 Define free body diagram. Illustrate with an example.

4 State the Varignon's theorem.

5 Differentiate centroid and centre of gravity.

6 What are the assumption made in finding out the force in the member of truss?

7 Define:

i) Coefficient of friction

ii) Angle of friction

8 Define radius of gyration.

9 State laws of friction.

10 What are the uses of Pappus theorem?

PART – B (5x10 = 50 Marks)

11 A bar of 4m length and of negligible weight is resting on smooth planes at A and B and subjected to loads as shown in Fig. 1. Determine the angle θ for equilibrium. 10

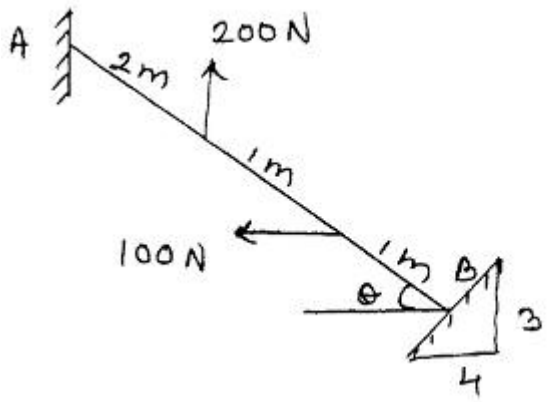

Fig. 1

12 A vertical load of 1100N is supported by the three bars as shown in Fig. 2. Find the force in each bar. Points C, O, D are in XZ plane while B is 5m above this plane. 10

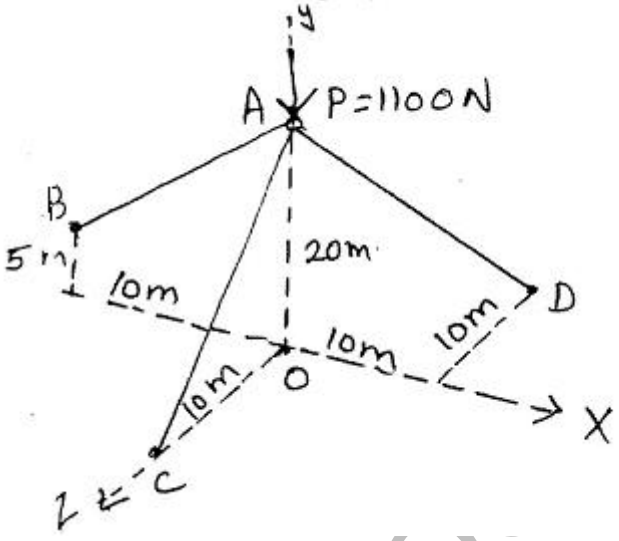

Fig. 2

13 Determine the forces in the truss shown in Fig. 3 which carries horizontal load of 12 kN and a vertical load of 18 kN. 10

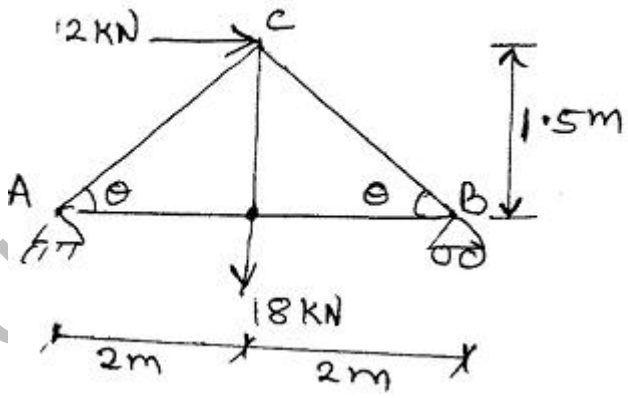

Fig. 3

14 Determine the force 'P' required to start the wedge shown in Fig. 4. The angle of friction with all surfaces at contact is 15^{o}. 10

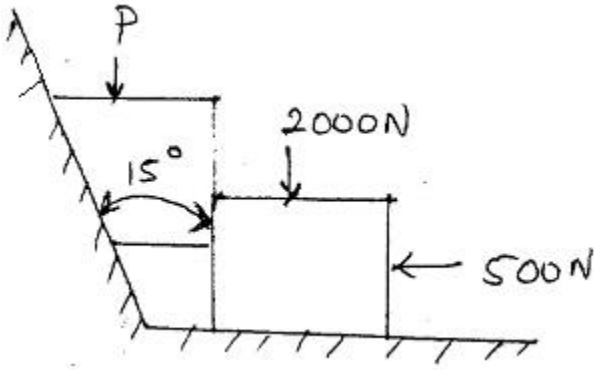

Fig 4

15 Find the centroid of shaded area as shown in Fig. 5. 10

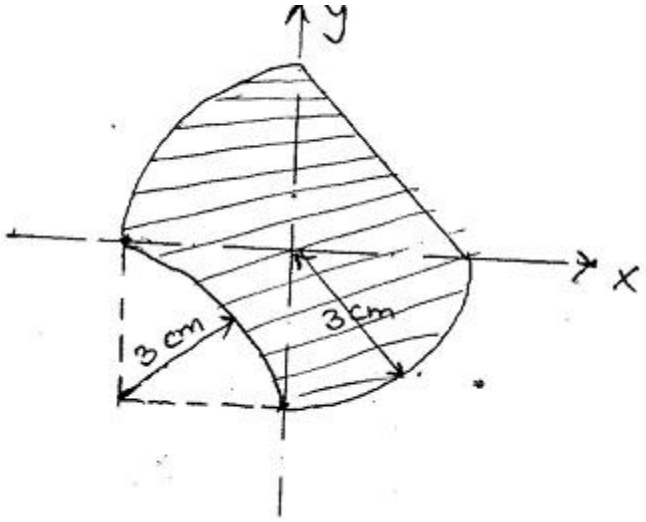

Fig 5

16 a) Derive from first principle the moment of inertia of a right angled triangle about base. 5

b) Find the moment of inertia of the shaded area as shown in Fig. 6 about centroidal yy axis. 5

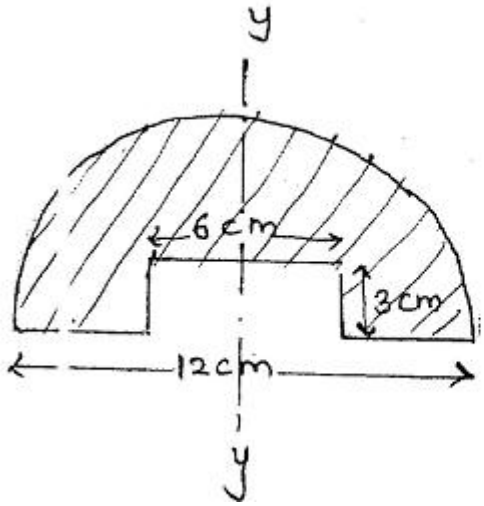

Fig. 6

17 a) Explain briefly product of inertia with an example. 3

b) State and prove 'parallel axis theorem'. 3

c) A rope make 1¼ turns around a drum is used to support a heavy weight. If coefficient of friction is 0.4. What weight can be supported by exerting a 50N force at other end of rope? 4

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