

B.Tech I Year II Semester (R15) Regular Examinations May/June 2016

**ENGINEERING MECHANICS**

(Civil Engineering)

Time: 3 hours

Max. Marks: 70

**PART – A**

(Compulsory Question)

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- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) What is the couple? What is the arm of couple and its moment?
  - (b) What are the conditions of equilibrium?
  - (c) Define the terms angle of friction and cone of friction.
  - (d) What are the static and dynamic frictions?
  - (e) How does centroid differ from centre of gravity?
  - (f) Define the terms moment of inertia and radius of gyration.
  - (g) Distinguish between uniform motion and uniform acceleration motion.
  - (h) Define Kinetics and name two examples of kinetics.
  - (i) What is the difference between the perfect frame and imperfect frame?
  - (j) What do you understand by the seconds pendulum?

**PART – B**

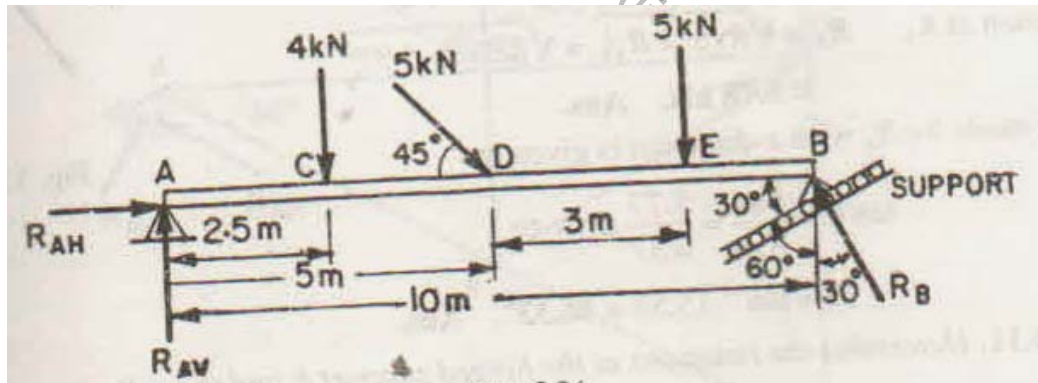
(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

- 2 A wheel has five equally spaced radial spokes and all are in tension. If the tensions in three consecutive spokes are 1000 kN, 1400 kN and 1200 kN respectively, find the tensions in other two spokes considering the wheel is in equilibrium.

**OR**

- 3 A beam AB 10 m long is hinged at A and supported on rollers over a smooth surface inclined at  $30^\circ$  to the horizontal at B. The beam is loaded as shown in figure below. Determine the reactions at A and B.

**UNIT – II**

- 4 A weight of 60 kN is on the point of motion down rough inclined plane when supported by a force of 24 kN acting parallel to inclined plane. The same weight is also on the point of motion up the same plane under the action of 36 kN applied parallel to the plane. Find the coefficient of friction of the plane.
- OR**
- 5 A block weight of 1500 N overlying a  $10^\circ$  wedge on a horizontal floor and leaning against a vertical wall is to be raised by applying a horizontal force to the wedge. Assuming the coefficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force required to raise the block.

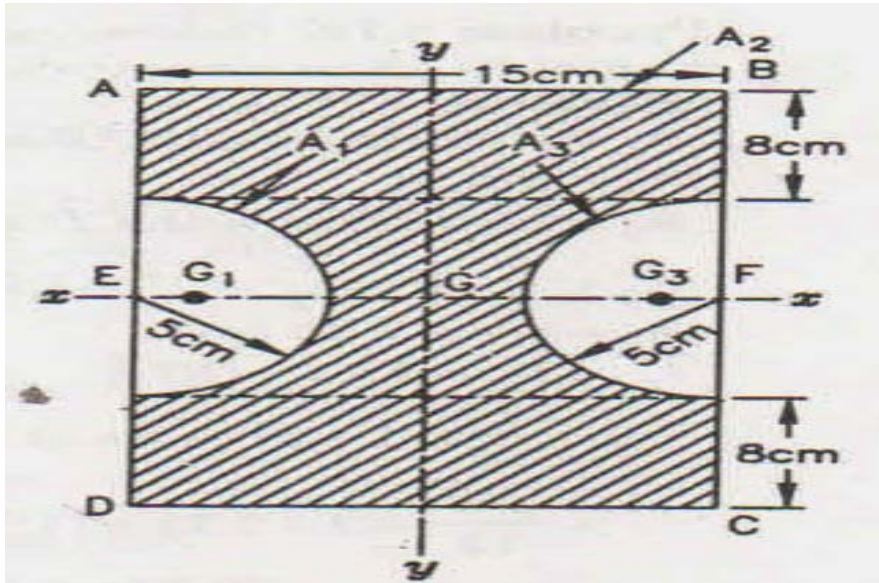
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**UNIT – III**

- 6 (a) Locate the centroid of surface of a triangular surface of size  $b \times h$ .  
(b) Determine the coordinates of the centre of gravity a solid hemisphere of radius 'R'.

OR

- 7 Determine the moment of inertia and radius of gyration of the section shown in figure below. about the centroidal axes.



**UNIT – IV**

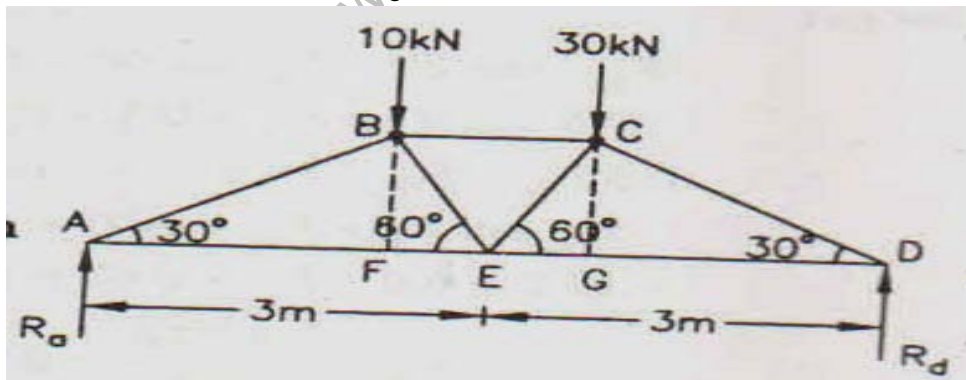
- 8 The angular acceleration of a fly wheel is given by  $\alpha = 12 - t$ , where  $\alpha$  is in  $\text{rad/sec}^2$  and  $t$  is in seconds. If the angular velocity of the flywheel is 60  $\text{rad/sec}$  at the end of 4 seconds, determine the angular velocity at the end of 6 seconds. How many revolutions take place in these 6 seconds?

OR

- 9 Two bodies weighing 25 N and 20 N are connected to the ends of an inextensible string, which passes over a smooth pulley. The weight 25 N is placed on a  $20^\circ$  inclined plane while the weight 20 N is hanging over the pulley. Determine:  
(a) Acceleration of the system when 25 N moves up.  
(b) Tension in the string. Take the coefficient of friction between the plane and body as 0.25.

**UNIT – V**

- 10 A truss is loaded as shown in figure below. Find out the stresses in the members of the truss.



OR

- 11 A body is moving with simple harmonic motion and has velocities of 8 m/s and 3 m/s at a distance of 1.5 m and 2.5 m respectively from the centre. Find the amplitude and time period of the body.

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