Code: 15A01201 **R15**

B.Tech I Year II Semester (R15) Regular & Supplementary Examinations May/June 2019

ENGINEERING MECHANICS

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

*****

1 Answer the following: (10 X 02 = 20 Marks)

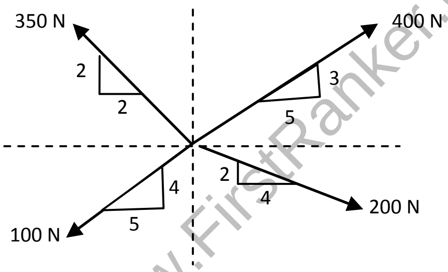
(a) What is a force polygon? Mention some of the uses of force polygon.
(b) State principle of moments.
(c) Define the terms: (i) Angle of friction. (ii) Angle of repose.
(d) State the laws of friction.
(e) Distinguish between centroid and centre of gravity.
(f) State the parallel axis theorem.
(g) Differentiate between rectilinear motion and curvilinear motion.
(h) State work energy theorem.
(i) What are the assumptions made in finding forces in a frame?
(j) Explain the terms amplitude and frequency related to Simple harmonic motion.

PART – B

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

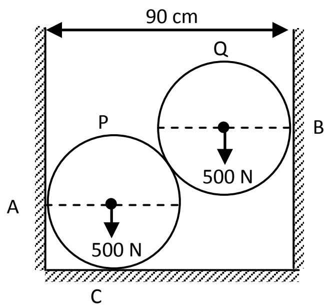
UNIT – I

2 (a) Classify the system of forces with neat sketches.
(b) Determine the resultant of four forces concurrent at the origin as shown in figure below.



OR

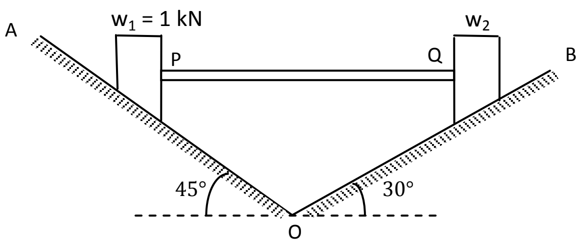
3 Two smooth spheres P, Q each of radius 25 cm and weighing 500 N, rest in a horizontal channel having vertical walls as shown in figure below. If the distance between the walls is 90 cm. Calculate the reactions at points of contact A,B and C.



Contd. in page 2

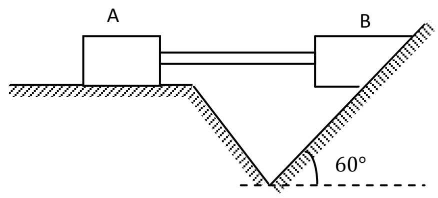
UNIT – II

4 Two loads, W_1 (equal to 1 kN) and W_2 resting on two inclined rough planes OA and OB are connected by a horizontal link PQ as shown in figure below. Find the maximum and minimum values of W_2 for which the equilibrium can exist. Take angle of friction for both the planes as 20°.



OR

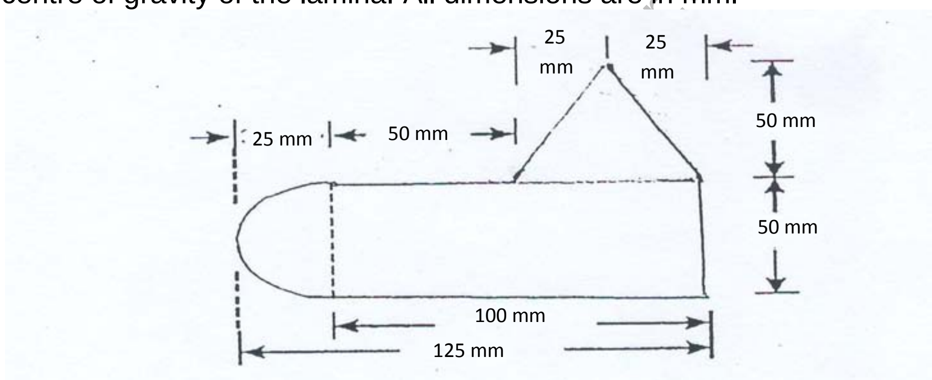
5 Two blocks A and B, connected by a horizontal rod and frictionless hinges are supported on two rough planes as shown in figure below. The coefficients of friction are 0.3 between block A and the horizontal surface, and 0.4 between block B and the inclined surface. If the block B weighs 100 N, what is the smallest weight of block A, that will hold the system in equilibrium.



UNIT – III

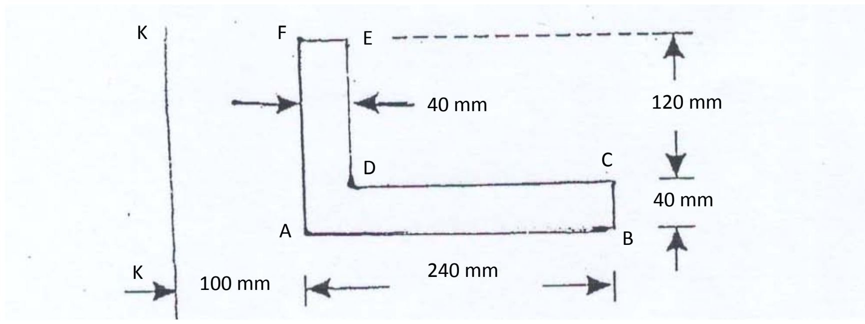
6 (a) Derive an expression for the centroid of a semi-circle.

(b) A uniform lamina shown in Fig. 5 consists of a rectangle, a circle and a triangle. Determine the centre of gravity of the lamina. All dimensions are in mm.



OR

7 Compute the moment of inertia of the area about axis K-K as shown in figure below.



Contd. in page 3

UNIT – IV

8 (a) Two electric trains A and B leave the same station on parallel lines. The train A starts from rest with a uniform acceleration of 0.2 m/s^2 and attains a speed of 45 km/h. which is maintained constant afterwards. The train B leaves 1 minute after with a uniform acceleration of 0.4 m/s^2 to attain a maximum speed of 72 km/h which is maintained constant afterwards. When will the train B overtake the train A?

(b) A stone is thrown up with a velocity of 20 m/s. While coming down, it strikes a glass pan, held at half the height through which it has risen and loses half of its velocity in breaking the glass. Find the velocity with which it will strike the ground.

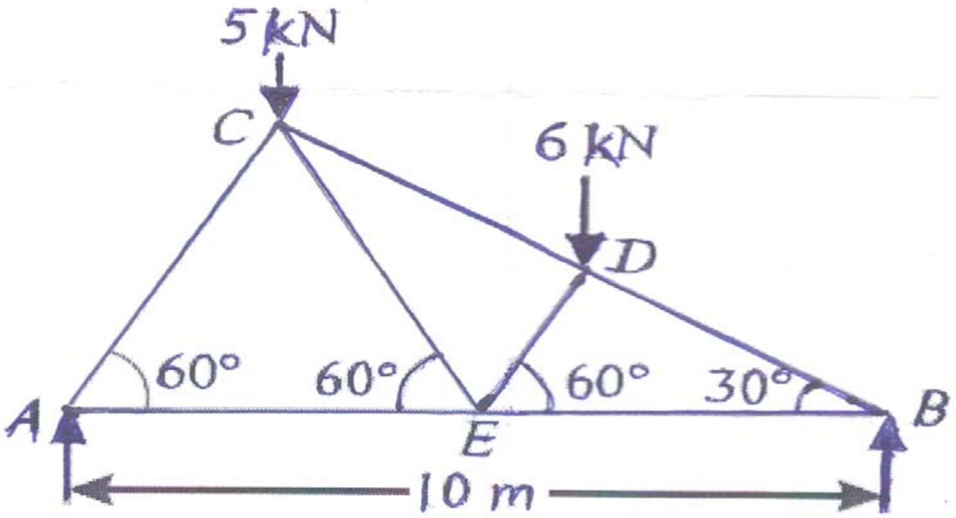
OR

9 (a) Explain the concept of D'Alembert's Principle.

(b) A body of mass 200 kg is initially stationary on a 15° inclined plane. What distance along the incline must the body slide before it reaches a speed of 10 m/s? Take coefficient of friction between the body and the plane as 0.1.

UNIT – V

10 A truss of span 10 meters is loaded as shown in Fig.8. Find the reactions and forces in the members of the truss.



OR

11 (a) Explain the oscillation of a simple pendulum with a neat sketch.

(b) A body moving with simple harmonic has amplitude of 1 meter and a period of oscillation of 2 seconds. What will be its velocity and acceleration 0.4 second and after passing an extreme position?

*****