Code No: R19ES1204 **R20** SET - 1

I B. Tech II Semester Supplementary Examinations, August- 20212

ENGINEERING MECHANICS

(Com. to ME, Chem. E, Pet E, Agri E)

Time: 3 hours Max. Marks: 75

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

Unit - I

1 a) Define and explain the following (7M)
(i) Coefficient of friction (ii) Limiting friction (iii) Cone of friction

b) A ladder 5m long and of 250N weight is placed against a vertical wall in a position where its inclination to the vertical is 30^0. A man weighing 800N climbs the ladder. At what position will he induce slipping? The co-efficient of friction for both the contact surfaces of the ladder namely with the wall and the floor is 0.2. (8M)

Or

2 a) Determine the magnitude, direction and position of the resultant of the system of forces as shown in Figure. 1 (9M)

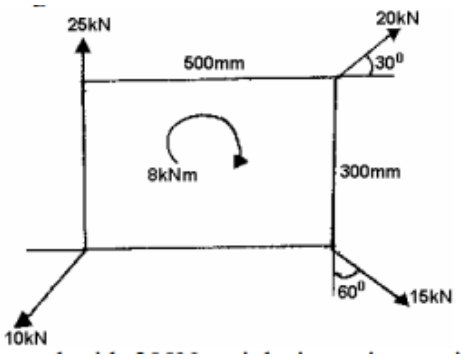


Figure:

b) Explain moment of force and its applications. (6M)

Unit - II

3 A load of 60kN is to be resisted by means of a shear leg arrangement as shown in Figure 2. Determine forces in legs AB, AC and rope AD. (15M)

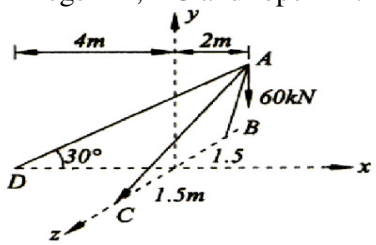
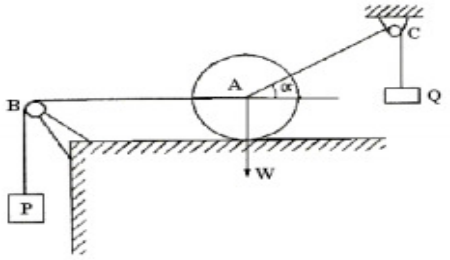


Figure:

Or

4 a) Explain the following: (8M)
i) Converse of the law of polygon of forces
ii) Condition of equilibrium and equations of equilibrium for spatial system of forces.

b) A ball of weight W rests upon a smooth horizontal plane and has attached to its center two strings AB and AC which pass over friction less pullies at B and C and carry loads P and Q, respectively, as shown in the figure . If the string AB is horizontal, find the angle α that the string AC makes with the horizontal when the ball is in a position of equilibrium. Also find the pressure R between the ball and the plane. (7M)



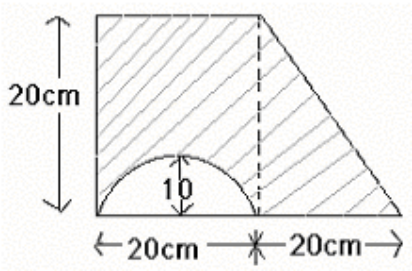
Figure

Unit - III

5 A steel ball of diameter 150 mm rests centrally over a concrete cube of size 150 mm. Determine the center of gravityof the system, taking the weight of concrete as equal to 25000 N/m^3 and that of steel as 80000 N/m^3. (15M)

Or

6 a) Find the moment of inertia about shaded area parallel to x – axis as shown in Figure. (10M)



Figure

b) Explain about transfer formulae for product of inertia and mass moment of inertia. (5M)

Unit - IV

7 a) A particle under a constant deceleration is moving in a straight line and covers a distance of 20m in first two seconds and 40m in the next 5 seconds. Calculate the distance it covers in the subsequent 3 seconds and the total distance covered, before it comes to rest. (8M)

b) A ball is dropped from the top of a tower 30 in high. At the same instant a second ball is thrown upward from the ground with an initial velocity of 15 m/sec. When and where do they cross and with what relative velocity? (7M)

Or

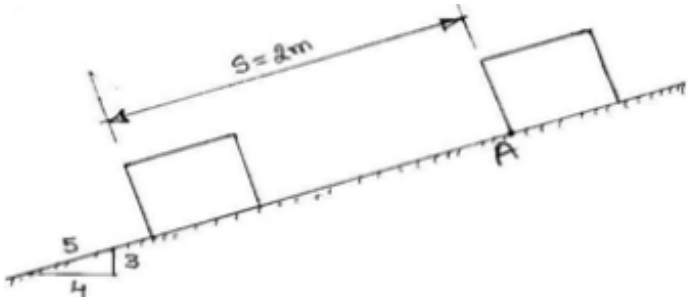
8 a) The velocity of a particle moving in a straight line is given by the expression. v = $t^3 - t^2 - 2t + 2$. The particle is found to be at a distance 4 m from station A after 2 seconds. Determine; i) acceleration and displacement after 4 seconds; and ii) maximum/minimum acceleration. (8M)

b) A particle has travelled 396.9 m in three seconds, 392 m in next four seconds and 270 m in the next five seconds. Prove that the particle is moving with uniform acceleration. Also find the time before it comes to rest. (7M)

Code No: R19ES1204 **R20** SET - 1

Unit - V

9 The 200N(~20kg) crate as shown in Figure, has a velocity of V_A = 4m/s when it is at A. Determine its velocity after it slides S = 2m down the plane. The coefficient of Kinetic friction between the crate and the plane is μ_K= 2.0. Apply work and energy principle. (15M)



Figure

Or

10 A 2000 Kg Automobile is driven down a 5^0 incline at a speed of 90 km/h. When the brakes are applied causing a constant total braking force of 7.5 KN. Determine the distance travelled by automobile as it comes to stop. Use work-energy method. (15M)