Exam. Code: 0905
Sub. Code: 6188

2123

B.E. (Mechanical) First Semester

ME101: Engineering Mechanics

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

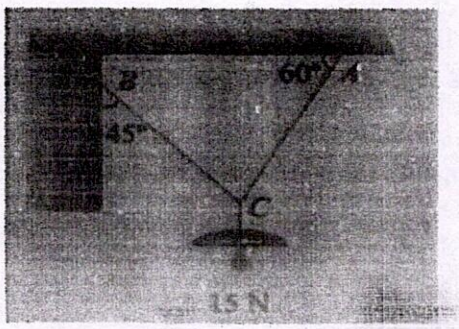
x-x-x

Q1a)What is the significance of a dot product
b)Explain the principle of moments
c)Define radius of gyration
d)What are conservative forces.
e)Write normal and tangential components of acceleration (10)

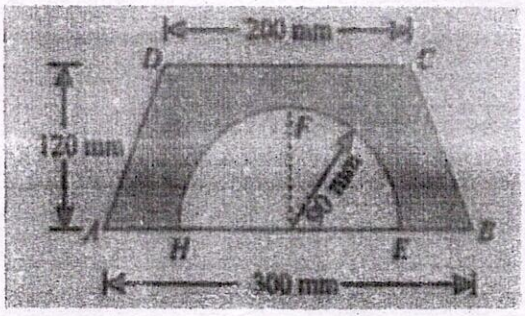
Part-A

Q2a)The following forces acts at a point: i)20N inclined at 30° towards North of East, ii) 25 N towards north, iii)30 N towards North West and 35 N inclined at 40° towards South of West .Find the magnitude and direction of resultant force. (5)

b)An electric light fixture weighing 15 N from a point C by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal as shown in the figure below. Determine the forces in strings AC and BC. (5)



Q3a)A semicircle of 90 mm radius is cut from a trapezium as shown in figure below. Find the position of centre of gravity of the figure. (5)



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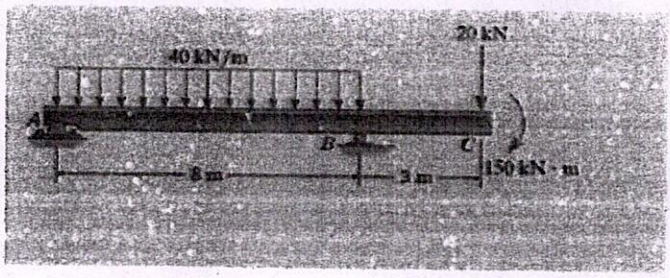
b)Explain step by step procedure of method of joints to analyze framed structures. (5)

Q4a)Draw shear force and bending moment diagram for the beam loaded and supported as shown in figure below (5)



b)A body resting on a rough horizontal plane required a pull of 24 N inclined at 30° to the plane just to move it. It was also found that a push of 30 N at 30° to the plane was just enough to cause motion to impend. Make calculations for the weight of the body and the coefficient of friction. (5)

Part-B

Q5a)On a bumpy road ,the motorist applies brakes and the speed of the vehicle reduces uniformly from 60 km/hr at point A to 40 km/hr at point B ; A and B are 120 m apart. If the vehicle has a resultant acceleration of 2.5 m/s^2 at point A, estimate the radius of curvature of the road at this point. Proceed to calculate the acceleration of the vehicle at point B where the road has a radius of curvature equal to 90 m . (5)

b)A ball of mass 2 kg moving with a velocity of 3 m/s impinges on a ball of mass 4kg moving with a velocity of 1m/s. The velocities of two balls are parallel and inclined at 30° to the line joining their centres at the instant of impact. If the coefficient of restitution is 0.5, find

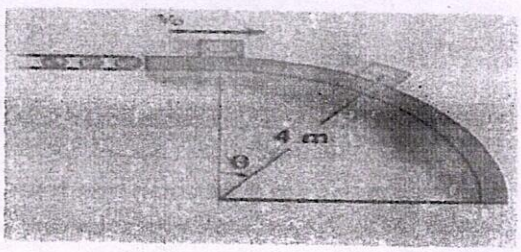
i)direction in which the 4 kg ball will move after impact

ii)velocity of the 4 kg ball after impact

iii)direction in which the 2 kg ball will move after impact and

iv)velocity of the 2 kg ball after impact. (5)

Q6a)Packages having mass of 12 kg are delivered from a conveyor to a smooth circular ramp with the velocity of V_o= 2.8 m/s as shown in figure below. If the radius of the ramp is 4 m , determine the angle $\theta=\theta_{max}$ at which the package begins to leave the surface of ramp using principle of work and energy . (6)



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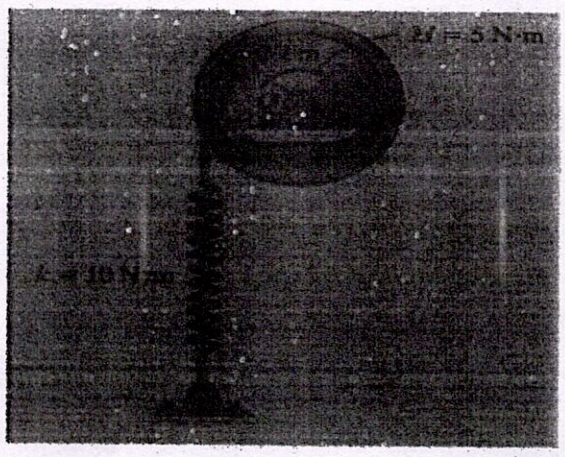
b)Explain general plane motion with an example. (4)

Q7a)The 30 kg disc as shown in figure below is pin supported at its centre. Determine the angle through which it must rotate to attain an angular velocity of 2 rad/s starting from rest. It is acted upon by a constant couple moment M=5 N-m. The spring is originally unstretched and its cord wraps around the rim of the disc. (6)



b)Derive the relation for kinetic energy of rigid body having general plane motion. (4)

X-X-X