

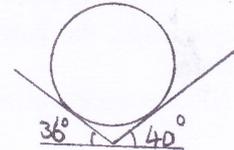
B.Tech. Degree I&II Semester Examination in Marine Engineering May 2017

MRE 1105 ENGINEERING MECHANICS (2013 Scheme)

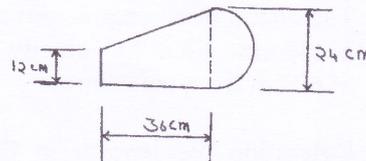
Time : 3 Hours

Maximum Marks : 100

- I. (a) A ball weighing 1000 N is supported by two inclined plane as shown in figure. Find the support reactions. (6)



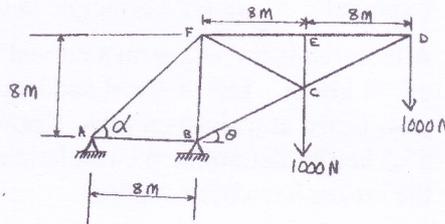
- (b) Locate the centroid of the area shown in the figure. (10)



OR

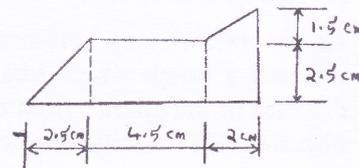
- II. (a) In a concurrent force system, two forces are acting on a point in two different conditions. If they act at 60° their resultant is 24 kN and if they act at right angles, their resultant is 20 kN. Determine the magnitude of two forces. (6)

- (b) Determine the reactions at A and B, and also forces in members BC, FC and FE. (10)



- III. (a) Write notes on (i) Mass moment of inertia. (ii) Radius of gyration. (6)

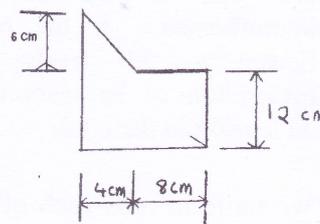
- (b) Find moment of inertia of the lamina shown in figure with respect to the horizontal centroidal axis. (11)



OR

- IV. (a) Briefly describe (i) Product of inertia (ii) Principal axis. (6)

- (b) Determine polar moment of inertia of the figure shown. (11)



- V. (a) What is principle of virtual work? Explain. (6)

- (b) Write notes on:
 (i) Stable and unstable equilibrium
 (ii) Differential pulley block.
 (iii) Worm driven chain block.
 (iv) Single purchase crab winch. (11)

OR

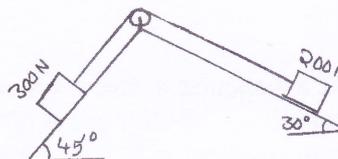
- VI. (a) Explain advantages and efficiency of wheel and axle. (6)
 (b) Briefly explain:
 Power lost due to friction in simple bearing. (11)
 Friction in belt drives.
 Efficiency of screw jack.

- VII. (a) A car starts from rest with a constant acceleration of 4 m/s^2 . Determine the distance travelled in the 7th second. (6)
 (b) A particle moves along a straight line with a velocity given by $v = 2t^3 - t^2 - 2t + 4$, where v is the velocity in m/s and t is the time in seconds. When $t = 2$ seconds, the particle is found to be at a distance of 10 m from a station. Determine: (10)

- (i) The acceleration (ii) The displacement of the particle after 6 seconds.

OR

- VIII. (a) The piston of an engine moves with SHM. The crank rotates at 100 rpm and stroke is 180 cm. Find the velocity and acceleration of the piston, when it is at a distance of 60 cm from the centre. (6)
 (b) Determine the tension in the string and acceleration of the bodies when released from rest. Take $\mu = 0.25$ (10)

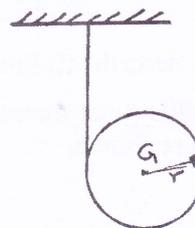


- IX. (a) Explain D' Alembert's principle in curvilinear translation. (6)
 (b) A motorist is travelling on a curved section of highway of radius 800 m at the speed of 90 km/hr. The motorist suddenly applies the brakes, causing the automobile to slow down at a constant rate. Knowing that after 85 the speed has been reduced to 67.5 km/hr, determine the resultant acceleration of the automobile immediately after the brakes have been applied. (11)

OR

- X. (a) Derive the equation for time of flight, and horizontal range for a projectile, is projecting with an angle of θ with the horizontal, at initial velocity 'u'. (6)
 (b) An air-craft moving horizontally at a speed of 108 km/hr at an altitude of 1000 m, released a bomb which hits, the target on the ground. Estimate the horizontal distance of the aircraft from the target when it releases the bomb. Also calculate the direction and velocity with which the bomb hits the target. (11)

- XI. A right circular cylinder of mass 'm' and radius 'r' is suspended from a cord that is wound round its circumference. If the cylinder is allowed to fall freely, find the acceleration of its mass centre 'G' and tension in the cord. (17)



- XII. Two uniform rods each of mass 'M' and length 'L' are welded together to form a 'T' shape assembly as shown in figure. Determine the time period of oscillations of the assembly. (17)

