Reg. No. : | | | | | | | | | | |

Question Paper Code: 53705

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Third Semester

Mechanical Engineering

01UME305 – ENGINEERING MECHANICS

(Regulation 2013)

Duration: 1.15 hrs Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. If the resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is

   (a) 30^o (b) 60^o (c) 90^o (d) 120^o

2. Concurrent forces are those forces whose lines of action

   (a) lie on the same line (b) meet at one point

   (c) meet on the same plane (d) none of these

3. The resultant of the two forces *P* and *Q* is R. If *Q* is doubled, the new resultant is perpendicular to *P*. Then

   (a) $P = Q$ (b) $Q = R$ (c) $Q = 2R$ (d) none of these

4. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to

   (a) Area of triangle (b) Twice the area of triangle

   (c) Half the area of triangle (d) None of these

5. The centre of gravity of a quarter-circle lies at a distance of ..... from the base measured along the horizontal radius

(a) $\frac{3\pi}{4r}$ (b) $\frac{4r}{3\pi}$ (c) $\frac{3r}{8}$ (d) $\frac{8}{3r}$

6. Moment of inertia of a circular section about an axis perpendicular to the section is

(a) $\pi d^3/16$ (b) $\pi d^3/32$ (c) $\pi d^4/32$ (d) $\pi d^4/64$

7. The range of a projectile is maximum, when the angle of projection is

(a) 30^o (b) 45^o (c) 60^o (d) 75^o

8. During elastic impact, the relative velocity of the two bodies after impact is _____ the relative velocity of the two bodies before impact.

(a) equal to (b) less than
(c) equal and opposite to (d) greater than

9. The maximum frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as

(a) static friction (b) dynamic friction
(c) limiting friction (d) coefficient of friction

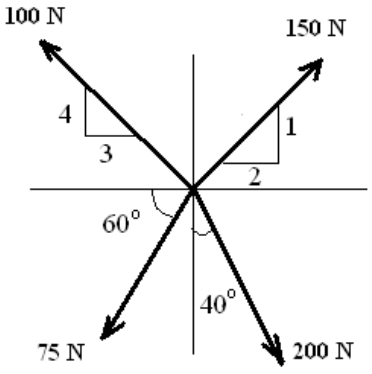
10. The bodies which rebound after impact are called

(a) inelastic bodies (b) elastic bodies
(c) neither elastic or inelastic bodies (d) None of these

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. For the system of four forces acting on a body shown in figure, determine the resultant force and its direction. (8)



12. Blocks *A* and *B* of weight 200*N* and 100*N* respectively, rest on a 30° inclined plane and are attached to the post which is held perpendicular to the plane by force *P*, parallel to the plane, as shown in figure 4. Assume that all surfaces are smooth and that the cords are parallel to the plane. Determine the value of *P*. Also find the Normal reaction of Blocks *A* and *B*. (8)

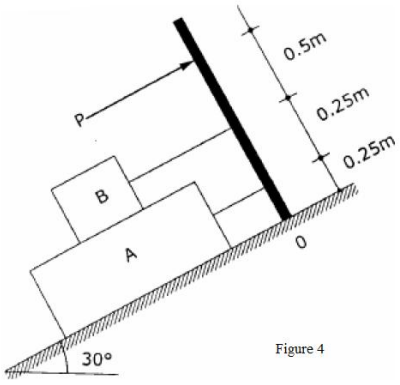
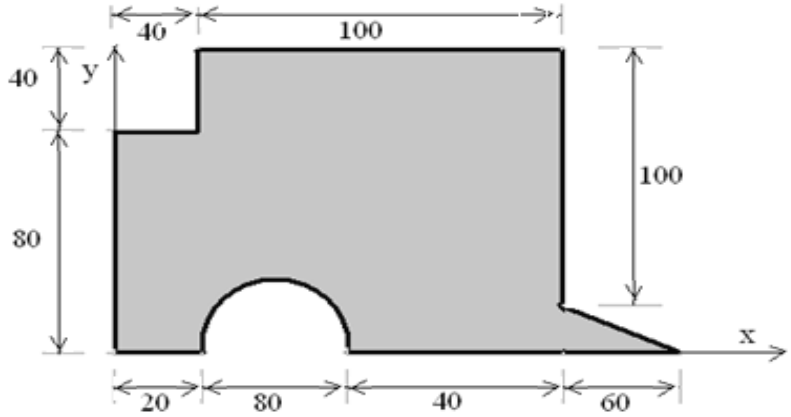


Figure 4

13. Determine the centroid coordinates of the area shown in the figure, with respect to the shown x-y coordinate system. (8)



All dimensions are in mm

14. A bullet of mass 25 gram is moving with a velocity of 500 m/s and fired into a body of 12 kg, which is suspended by a string, fixed at top, 1 m long. The bullet gets embedded into the body and the unit (ie, bullet + body) swings through some angle. Find out the angle through which the unit swings. (8)

15. Find the force P inclined at an angle of 32° to the inclined plane making an angle of 25° with the horizontal plane to slide a block weighing 125 *kN* (i) up the inclined plane (ii) down the inclined plane, when μ = 0.5. (8)