A　　　　　　　　**Reg. No. :**

Question Paper Code: 53A03

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2018

Third Semester

Agricultural Engineering

15UAG303 - FUNDAMENTALS OF ENGINEERING MECHANICS

(Regulation 2015)

Duration: Three hours　　　　　　　　　　　　　　　Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The process of finding out the resultant force is called _____ of forces.　　　CO1- R

    (a) Composition　　　(b) Two Points　　　(c) Parallel Plane　　(d) Perpendicular Plane

2. A weight of 1000 N can be lifted by an effort of 80 N. If the velocity ratio is 20, the machine is　　　CO1- R

    (a) Reversible　(b) $\sqrt{P^2 + Q^2 + 2PQ\cos\theta}$　(c) $\sqrt{P^2 + Q^2 - 2PQ\cos\theta}$　(d) $\sqrt{P^2 + Q^2 - 2PQ\tan\theta}$

3. Whenever a force acts on a body and the body undergoes a displacement, then　　　CO2- R

    (a) One Horizontal Reaction　　　　　　(b) Work is said to be done

    (c) One Vertical Reaction　　　　　　　(d) All of the Above

4. A couple produces　　　　　　　　　　　　　　　　　　　CO2- R

    (a) Rotational motion　　　　　　　　　(b) Constitute a moment

    (c) Constitute a couple　　　　　　　　(d) Constitute a moment of couple

5. Polar Moment of Inertia follows _____　　　　　　　　　CO3- R

    (a) Parallel Axis Theorem　　　　　　　(b) Centroidal Axis Theorem

    (c) Perpendicular Axis Theorem　　　　(d) Radius of Gyration

6. The point, through which the whole weight of the body acts,   CO3- R
    irrespective of its position, is known as

    (a) Point, Weight   (b) Centre of gravity   (c) Line, Mass   (d) Lamina, Mass

7. The resultant of the two forces P and Q is R. If Q is doubled, the   CO4- R
    new resultant is perpendicular to P. Then

    (a) $P = Q$ (b) $Q = R$ (c) -3.33 m/s2   (d) 20 m/s2

8. The Momentum _____.   CO4- R
    (a) Mass x Velocity   (b) Mass x Displacement

    (c) Mass x Acceleration   (d) Mass x Gravitational Force

9. The friction experienced by a body, when in motion, is known as   CO5- R

    (a) Coefficient of friction   (b) Angle of response

    (c) Angle of friction   (d) Dynamic friction

10. Angular Velocity _____.   CO5- R

    (a) Linear Displacement x radius   (b) Linear velocity x radius

    (c) Linear Displacement / radius   (d) Linear velocity / radius

PART – B (5 x 2= 10Marks)

11. Define Parallelogram law of forces.   CO1- R

12. State Varignon's Principle.   CO2- R

13. Define centroidal axis.   CO3- R

14. Define rolling friction.   CO4- R

15. State any four coulomb's law of dry friction.   CO5- R

PART – C (5 x 16= 80Marks)

16. (a) Two forces P and Q are applied as shown Figure 1 at point A of a   CO1- App   (16)
         hook support. Knowing that P =15 N and Q = 25 N, determine the
         magnitude and direction of their resultant using
         (a) the parallelogram law,
         (b) the triangle law.

2

53A03
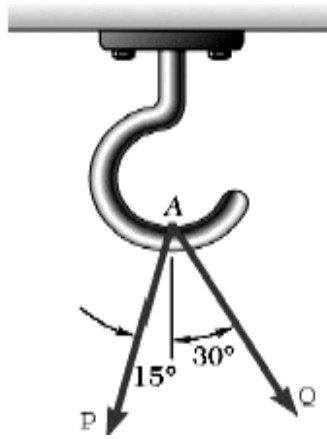
Figure - 1

Or

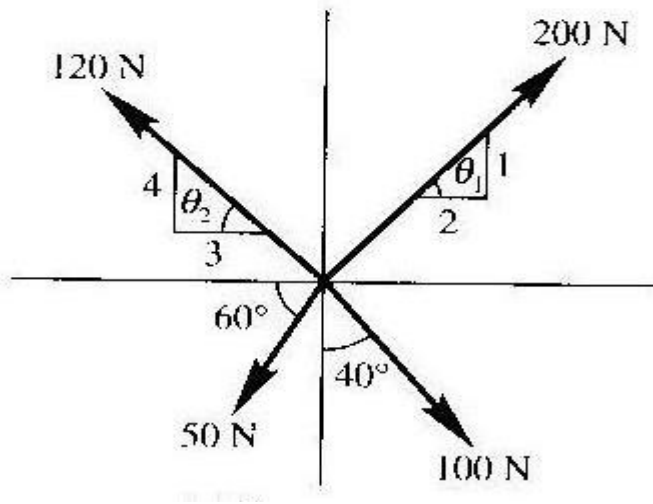(b) Find the resultant of given force system as shown in figure 2.   CO1- App   (16)

Figure - 2

17. (a)   Three cylinders weighting 100 N each and of 80 mm diameter   CO2- App   (16)
are placed in a channel of 180 mm width as shown in Figure 3.
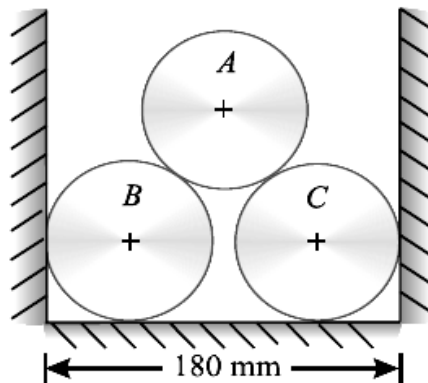Find the reactions at the surfaces of contact.

Figure - 3

3

53A03

Or

(b) Four forces of magnitude 15N, 25N, 35N and 45N are acting respectively along the four sides of square ABCD as shown in figure 4. Determine the resultant moment about the point A. Each side of the square is 3m.   CO2- App   (16)
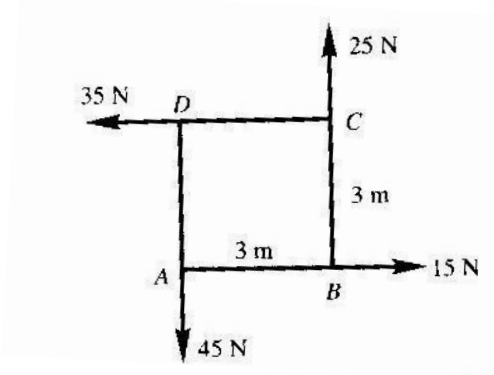

Figure - 4

18. (a) A semicircular area is removed from a trapezium as shown in Figure 5. Determine the centroid of the remaining area (shown hatched). All dimensions in cm.   CO3- App   (16)
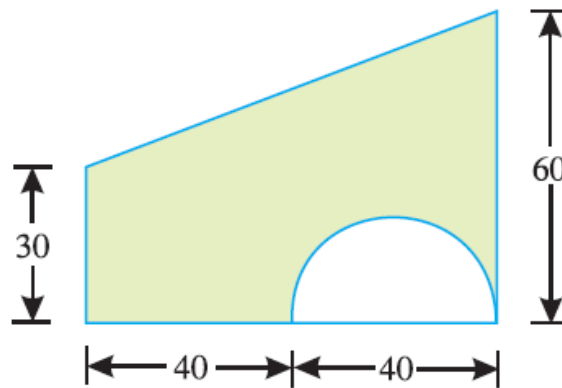

Figure - 5

Or

(b) A I-section is made up of three rectangles as shown in figure 6. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section.   CO3- App   (16)
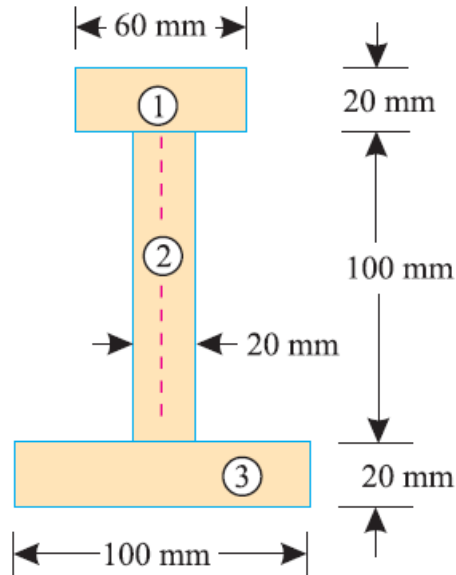
53A03

Figure - 6

19. (a) A soldier fires a bullet at an angle of 30^0 (upward from the CO4- App (16)
       horizontal) from his position on hill to strike a target which is
       61m lower than the position of the soldier. The initial velocity of
       the bullet is 91.5m/s. Calculate
       (i) The maximum height to which the bullet will rise above the
       horizontal.
       (ii) The actual velocity with which it will hit the target.
       (iii)The total time required for the flight of bullet.

Or

   (b) A sphere of mass 1 kg moving with a velocity of 2 m/s impinges CO4- U (16)
       directly on a sphere of mass 2 kg at rest. If the first mass comes to
       rest after the impact, find the final velocity of the second sphere
       and the co-efficient of restitution.

20. (a) A block of weight 150N is resting on a rough inclined plane as CO5- App (16)
       shown in figure. 7. The block is tied up by a horizontal string,
       which has a tension of 50N. Find
        (i) The frictional force on the block.
       (ii) The normal reaction of inclined plane.

53A03

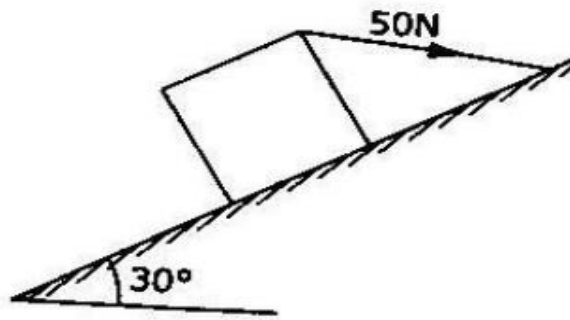Figure - 7

Or

(b) The coefficient of friction between the blocks A & B is 0.3 and block B and horizontal plane is 0.25. If a force of P = 900 N is applied as shown in figure 8. Find the resultant of frictional force on 150 kg block.   CO5- App   (16)

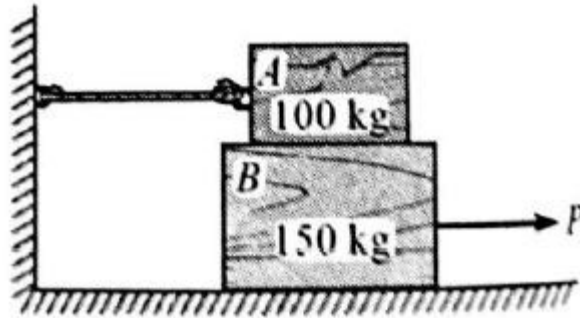Figure - 8

53A03