A   Reg. No. :

Question Paper Code: 53A03

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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. Which one not a unit of weight   CO1- R

    (a) N.   (b) kg.   (c) KN.   (d) MN.

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. Equal and opposite parallel forces create   CO2- R

    (a) Beam.   (b) Bending.   (c) Moment.   (d) Couple.

4. A couple produces   CO2- R

    (a) Rotational motion   (b) Constitute a moment

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

5. According to the parallel axis theorem   CO3- R

    (a) A=L (xθ).   (b) V= A (xθ).   (c) I=I$_G$+ah^2.   (d) I= I$_{xx}$+I$_{yy}$.

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

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

7. It the body perfectly elastic its coefficient of restitution is   CO4- R

    (a) 0.   (b) 1.   (c) 2.   (d) ½.

8. The Momentum _____.   CO4- R

    (a) Mass x Velocity   (b) Mass x Displacement

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

9. The The frictional force is always act in   CO5- R

    (a) Opposite direction of movement.   (b) Same direction of movement.

    (c) Perpendicular direction of movement.   (d) Scalar quantity.

10. Angular Velocity _____.   CO5- R

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

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

<div align="center">PART – B (5 x 2= 10Marks)</div>

11. Define kinematics.   CO1- R

12. Name the types of loads.   CO2- R

13. State perpendicular axis theorem.   CO3- R

14. Write work energy principle.   CO4- R

15. List the advantages of friction.   CO5- R

<div align="center">PART – C (5 x 16= 80Marks)</div>

16. (a) The lines of action of three forces are concurrent at the origin o CO1- App (16)
passes through points A,B and C having coordinates, (3,0,-3),(2,-2,4) and (-1,2,4) respectively. If the magnitude of the forces are 10N, 30N and 40N, find the magnitude and direction of their resultant.

<div align="center">Or</div>

17. (a) Two identical rollers, each of weight W = 1000 N, are supported CO2- App (16)
by an inclined plane and a vertical wall as shown in Fig. Find the reactions at the point of supports A,B and C. Assume all the surfaces to be smooth.
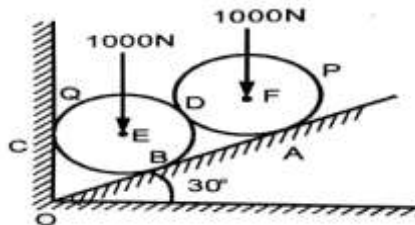

<div align="center">Or</div>

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

CO2- App   (16)
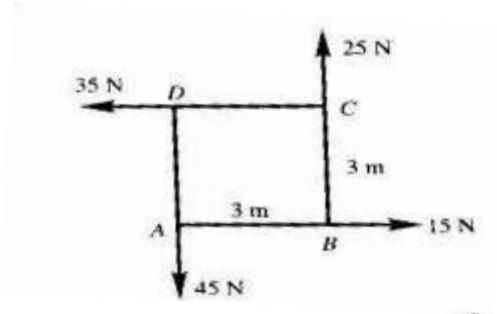
18. (a) Determine the moment of the section about the horizontal and vertical axes, passing through the centre of gravity of the T-section as shown in figure.

CO3- App   (16)
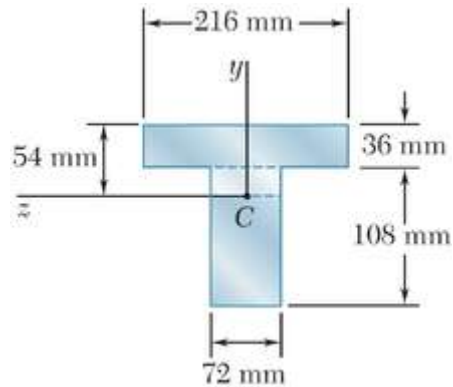
Or

(b) A I-section is made up of three rectangles as shown in figure 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
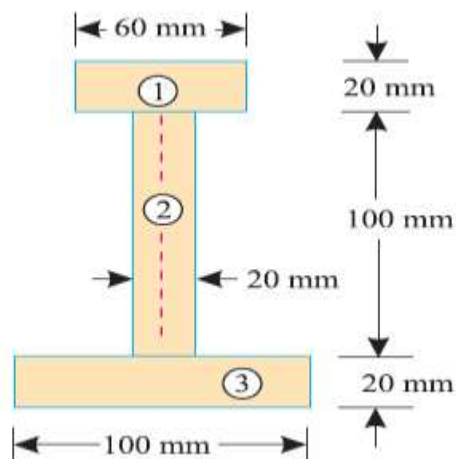
19. (a) A small grinding wheel is attached to the shaft of an electric   CO4- App   (16)
motor which has a rated speed of 3600 rpm. When the power is
turned on, the unit reaches its rated speed in 5 seconds and when
the power is turned off, the unit coasts to rest in 70 seconds.
Assuming uniformly accelerated motion. Determine the number
of revolution that the motor executes (i) in reaching its rated
speed and (ii) in coasting to rest.

<center>Or</center>

(b) A ball of mass 20kg moving with a velocity of 5 m/s strikes   CO4- U   (16)
directly another ball of mass 10 kg moving in the opposite
direction with a velocity of 10 m/s.If the coefficient of restitution
is equal to 5/6, and then determines the velocity of each ball after
impact.

20. (a) A body having mass of 22 kg rests on a plane inclined at 60   CO5- App   (16)
degrees with horizontal. The coefficient of friction between the
body and inclined plane is 1/3.The body is acted upon by a
horizontal force P. What is the value of P so that the body will not
slide down the plane? What is the value of P so that the body will
slide up the plane? In between these values, the body will be at
rest.

<center>Or</center>

(b) A pull of 20 N, inclined of 25° to the horizontal plane, is required   CO5- App   (16)
just to move a body placed on a rough horizontal plane. But the
push required to move the body is   25 N. If the push is inclined
at 25° to the horizontal, find the weight of the body and
co-efficient of friction.