Reg. No. :

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Third Semester

Agricultural Engineering

21UAG303 – INTRODUCTION TO ENGINEERING MECHANICS

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1.   The unit of weight _____.   CO2- U

   (a) kilogram   (b) Newton   (c)Watt   (d)Gram

2.   According to the Newton's First Law, The Resultant R is   CO2- U

   (a) $R \neq 0$ (b) $R = 1$ (c) R is infinitive   (d) 0

3.   Following is not a scalar quantity ?   CO2- U

   (a) Density   (b) mass   (c) Volume   (d) Acceleration

4.   Forces passing through a common point are known as   CO2- U

   (a) collinear forces   (b) Concurrent forces   (c) Multiple forces   (d) Scalar forces

5.   Two dimensional element the G is   CO2- U

   (a) Centre of gravity   (b) Centre of the area   (c) Centroid   (d) Cycloid

6.   Polar Moment of Inertia follows _____   CO2- U

   (a) Parallel Axis Theorem   (b) Perpendicular Axis Theorem

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

7.   Two non-collinear parallel equal forces acting in opposite direction   CO2- U

   (a) Balance each other   (b) constitute a moment

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

8.   The maximum frictional force increase as the _____force between the bodies CO2- U
     increase.

   (a) Parallel   (b) inclined   (c) normal   (d) gravitational

9. Frictional force encountered after commencement of motion is called   CO2- U

   (a) Post friction   (b)Limiting friction   (c)Angle of friction   (d) dynamic friction.

10. Coulomb friction is the friction between   CO2- U

   (a) Bodies having relative motion   (b) two dry surfaces

   (c) Two lubricated surfaces   (d) solids and liquids

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

11. Show the free body diagram with example   CO2- U

12. Solve the moment of the 100 N force about point A and B   CO3- App
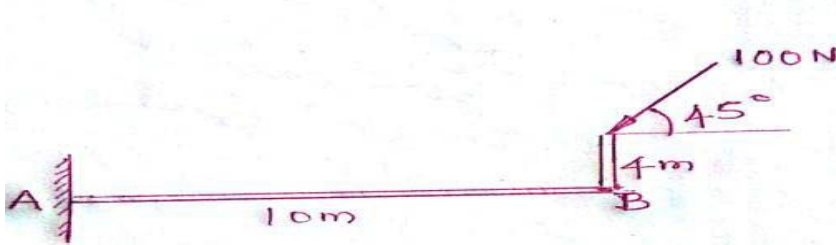
13. Show product of inertia with formula..   CO2- U

14. Compare and contrast the impact and elastic impact.   CO2- U

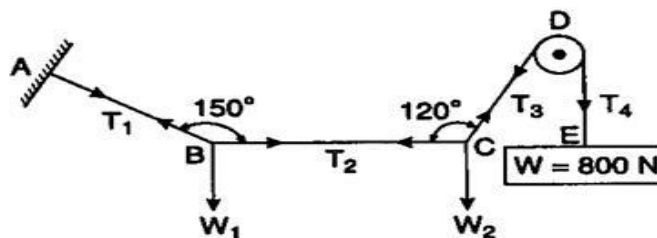15. Illustrate Coulomb's laws of dry friction.   CO2- U

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

16. (a) Compute the magnitude and angle and F so that particle shown in   CO3-App   (16)
   figure, is in Equilibrium.
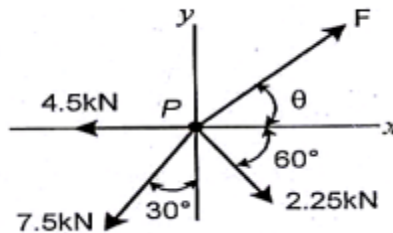
<div align="center">Or</div>

  (b) A system of connected flexible cable shown in Figure below is   CO3-App   (16)
      supporting two vertical forces W_1, W_2 at points B&C .Manipulate
      the forces in various segments of the cable

<div align="center">2</div>

<div align="right">**U3A03**</div>

17. (a) Two identical rollers, each of weight W = 50N are supported by an   CO3-App   (16)
inclined plane and a vertical wall as shown in figure below . Solve
the reactions at the point of supports .Assume all the surfaces to be
smooth.
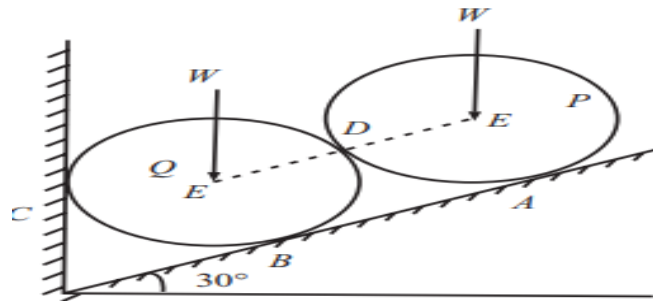
Or

(b) Four forces of magnitude and direction acting on a square ABCD   CO3-App   (16)
of side 2 m are shown in the figure. Solve the resultant in
magnitude and direction and also locate its point of application
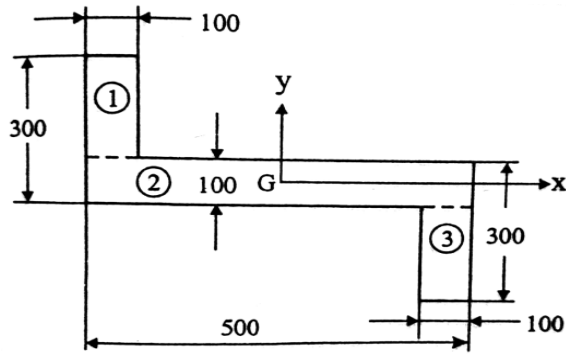with respect to the sides AB and AD
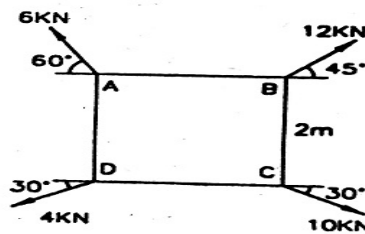
18. (a) Solve the principal moments of inertia and find location of   CO3- App   (16)
principal axes of surface shown in figure
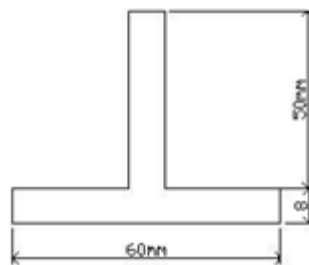
Or

(b) Compute Moment of Inertia about the co-ordinate axes of plane   CO3- App   (16)
area shown in fig. Also find Polar Moment of Inertia. All the
dimensions are in 'mm'

3

19. (a) A Burgalr's car had a start with acceleration of 2 m/s 2. A police CO3- App (16)
    vigilant party came after 5 second and continued to chase the
    Burgalr's car with a uniform velocity of 20m/s . Find the time
    taken in which the police van will overtake the Burgalr's car?

Or

(b) A car is moving with a velocity of 15m/sec. The car is brought to CO3- App (16)
    rest by applying brakes in 5 seconds. Determine
    (i) The retardation
    (ii) Distance travelled by the car after applying brakes.

20. (a) A Uniform ladder of weight 1000 N and length 4 m rests on a CO3- App (16)
    horizontal ground and leans against a smoothe vertical wall. The
    ladder makes an angle of 60^0 with horizontal , when a man of
    weight 750 N stands on the ladder at a distance of 3 m from the top
    of the ladder , the ladder is at the point of sliding .Determine the
    Coefficient of friction between ladder and the floor.

Or

(b) A uniform ladder of weight 250N and length 7m is placed against a CO3- App (16)
    vertical wall in a position where its inclination to the vertical is 30º.
    A man weight 800N climbs s the ladder. At what position will be
    induce slipping? Take coefficient of friction between the floor and
    ladder is μ=0.40 and that between the wall and ladder is μ=0.40.

4

U3A03