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Question Paper Code: U3705

B.E./B.Tech. DEGREE EXAMINATION, NOV 2022

Third Semester

Mechanical Engineering

21UME305 – BASICS OF ENGINEERING MECHANICS

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Number of forces are acting at a point, their resultant will be inclined at an angle θ   CO2- U
   with the horizontal, such that

   (a) $\tan \theta = \sum V / \sum H$ (b) $\tan \theta = \sum H / \sum V$ (c) $\tan \theta = \sum V \times \sum V$ (d) $\tan \theta = \sum V + \sum V$

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. Which one of the 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

PART – B (5 x 2= 10Marks)

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
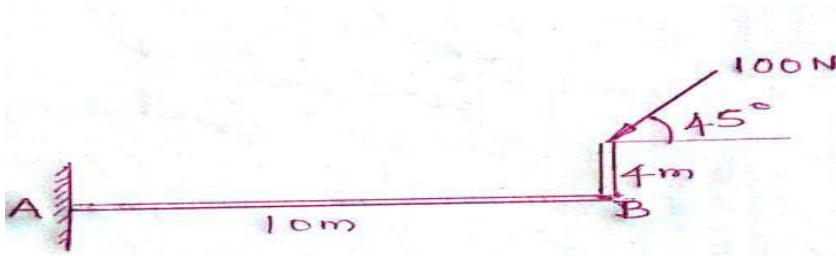
13. Show product of inertia with formula..   CO2- U

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

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

PART – C (5 x 16= 80 Marks)

16. (a) Predict the Resultant of the concurrent force system shown in the   CO3-App   (16)
   following Figure.
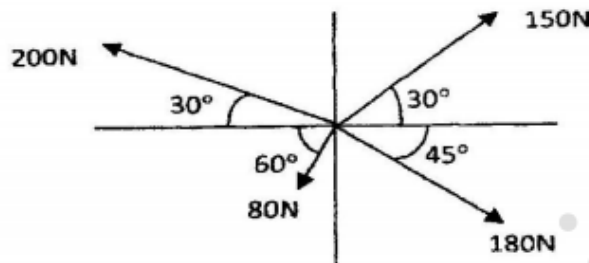
Or

(b) The resultant of the two forces, when they act at an angle of 60° is   CO3-App   (16)
     14 N. If the same forces are acting at right angles, their resultant is
     $\sqrt{137}$ N. Compute the magnitude of the two forces.

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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
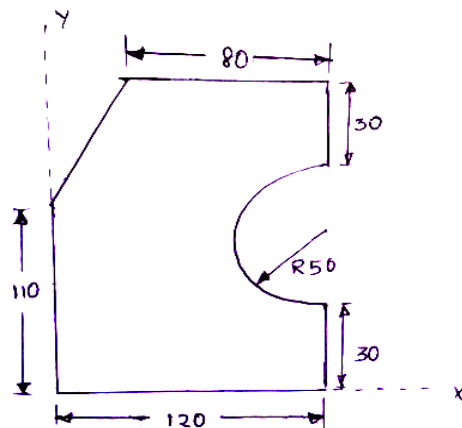   smooth.
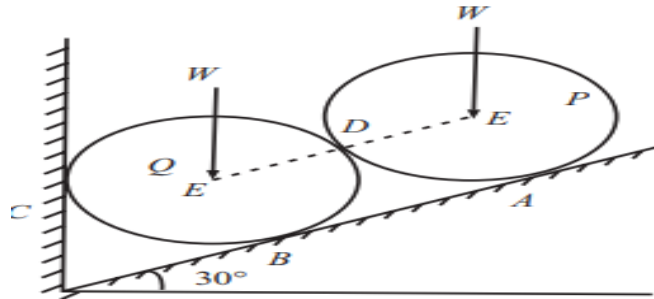
Or

   (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
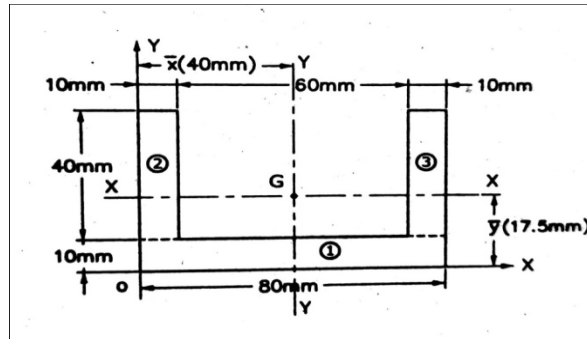   with respect to the sides AB and AD
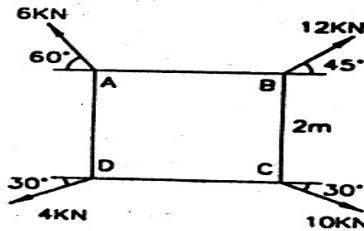
18. (a) Predict the centroid of the area shown in figure below. The   CO3- App   (16)
    dimensions are in mm.

Or

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(b) Solve the moment of inertia of the section shown below.   CO3- App   (16)


19. (a) Two bodies one of mass 30 kg, moves with a velocity of 9 m/sec   CO3- App   (16)
strikes on an another body of mass 15 kg moving in the opposite
direction with the velocity of 9 m/sec centrally. Solve the velocity
of each body after impact if coefficient of restitution is 0.8.

Or

(b) Two bodies one of mass 50 kg, moves with a velocity of 8 m/sec   CO3- App   (16)
strikes on an another body of mass 20 kg moving in the opposite
direction with the velocity of 10 m/sec centrally. Solve the
velocity of each body after impact if coefficient of restitution is 0.9

20. (a) A man can pull horizontally with a force of 450N. A mass of 350   CO3- App   (16)
kg is resting on a horizontal surface or which the coefficient of
friction is 0.20. The vertical cable of a crane is attached to the top
of the block as shown in fig what will be the tension in the cable if
the man is just able to start the block to the right?
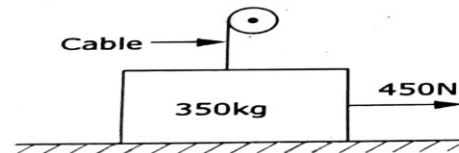
Or

(b) A Body of weight 100n is placed on a rough horizontal plane and   CO3- App   (16)
pushed by a force of 45N shown in fig. (a),(b) and (c) to just cause
sliding over the horizontal plane. Determine the co-efficient of
friction in all the three cases.

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