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**Question Paper Code: U3705**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2025

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)

- Forces passing through a common point are known as \_\_\_\_\_. CO2- U  
(a) collinear forces      (b) co-planer forces      (c) concurrent forces      (d) none of these
- 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
- Which one of the following is not a scalar quantity ? CO2- U  
(a) Density      (b) mass      (c) Volume      (d) Acceleration
- Forces passing through a common point are known as CO2- U  
(a) collinear forces      (b) Concurrent forces      (c) Multiple forces      (d) Scalar forces
- Two dimensional element the G is CO2- U  
(a) Centre of gravity      (b) Centre of the area      (c) Centroid      (d) Cycloid
- Polar Moment of Inertia follows \_\_\_\_\_ CO2- U  
(a) Parallel Axis Theorem      (b) Perpendicular Axis Theorem  
(c) Centroidal Axis Theorem      (d) Radius of Gyration
- 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
- The maximum frictional force increase as the \_\_\_\_\_ force between the bodies CO2- U increase.  
(a) Parallel      (b) inclined      (c) normal      (d) gravitational

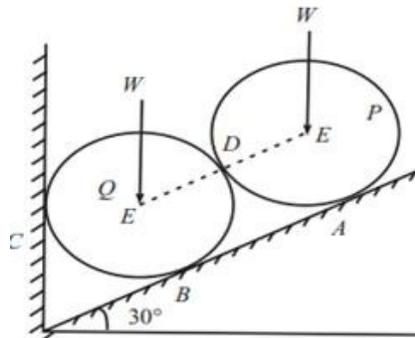
9. Frictional force encountered after commencement of motion is called CO2- U  
 (a) Post friction      (b) Limiting friction      (c) Angle of friction      (d) dynamic friction.
10. Coulomb friction is the friction between CO2- U  
 (a) Bodies having relative motion      (b) two dry surfaces  
 (c) Two lubricated surfaces      (d) solids and liquids

PART – B (5 x 2= 10Marks)

11. State Polygon law of forces CO1- U
12. What are the different type of loads CO1- U
13. State Parallel axes theorem CO1- U
14. The particle moving with  $s = 9t^3 + 2t + 2$ . Find velocity and acceleration when CO3- App  
 time  $t=6$  sec.
15. Define angle of friction CO1- U

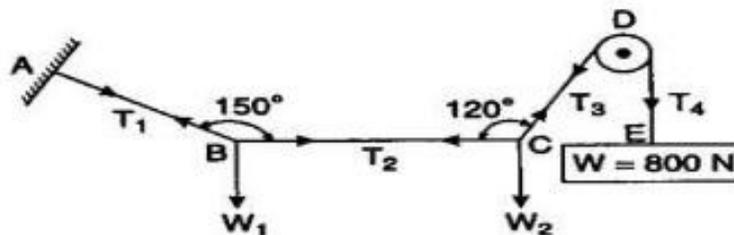
PART – C (5 x 16= 80 Marks)

16. (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.



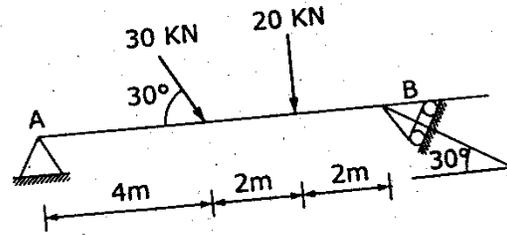
Or

- (b) 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



17. (a) Find the Support Reaction of the Beam

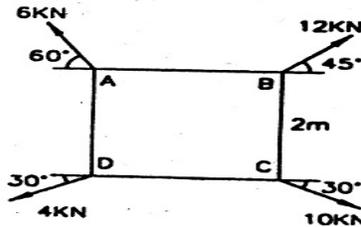
CO3-App (16)



Or

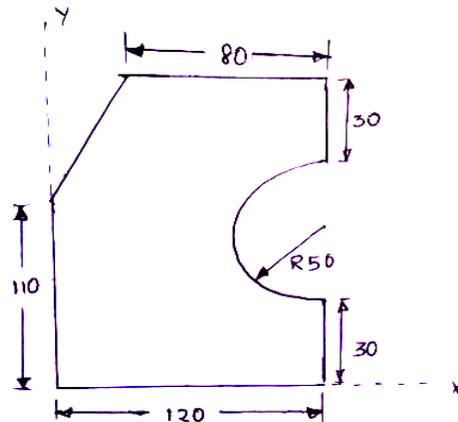
(b) Four forces of magnitude and direction acting on a square ABCD of side 2 m are shown in the figure. Solve the resultant in magnitude and direction and also locate its point of application with respect to the sides AB and AD

CO3-App (16)



18. (a) Predict the centroid of the area shown in figure below. The dimensions are in mm.

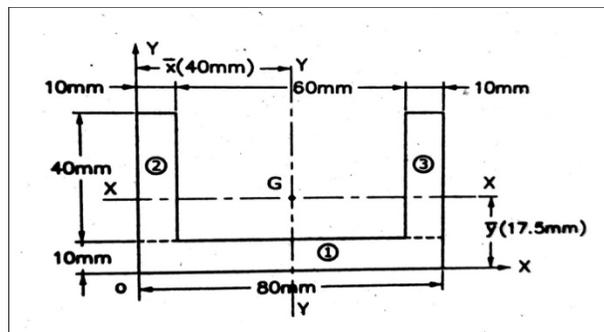
CO3- App (16)



Or

(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 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. CO3- App (16)

Or

- (b) Two bodies one of mass 50 kg, moves with a velocity of 8 m/sec 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 CO3- App (16)

20. (a) A Uniform ladder of weight 1000 N and length 4 m rests on a horizontal ground and leans against a smooth vertical wall. The ladder makes an angle of  $60^\circ$  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 CO2- App (16)

Or

- (b) What should be the value of the angle  $\theta$  so that motion of the 390N block impends down the plane? The coefficient of friction for all the surfaces is  $1/3$ . CO2- App (16)

