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Reg. No. :

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**Question Paper Code: 93705**

B.E./B.Tech. DEGREE EXAMINATION, NOV 2023

Third Semester

Mechanical Engineering

19UME305– ENGINEERING MECHANICS

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Which of the following is not a vector quantity CO1- R  
(a) weight                      (b) velocity                      (c) acceleration                      (d) force
- The unit of Power \_\_\_\_\_ CO1- R  
(a) Joule                      (b) Weber                      (c) Watt                      (d) Voltage
- Which one is the unit of Moment? CO2- R  
(a) N                      (b) N-m                      (c) N / m<sup>2</sup>                      (d) N / m
- The Moment of a couple (M) is \_\_\_\_\_ if 'a' is the arm of the couple. CO2- R  
(a)  $M = Fa^2$                       (b)  $M = Fa^3$                       (c)  $M = F / a$                       (d)  $M = F a$
- The point at which the resultant of all \_\_\_\_\_ act is called Centre of gravity. CO3- R  
(a) Perpendicular force                      (b) Inclined forces                      (c) Parallel forces                      (d) All the above
- The unit of moment of inertia if an area is CO3- R  
(a)  $kg\text{-}m^2$                       (b)  $kg\text{-}m\text{-}s^2$                       (c)  $kg/m^2$                       (d)  $m^4$
- Varignon's theorem is used to find \_\_\_\_\_ CO4- R  
(a) direction of resultant force                      (b) location of resultant force  
(c) Magnitude of resultant force                      (d) nature of resultant force
- The total motion possessed by a body, is called CO4- R  
(a) moment                      (b) mass                      (c) weight                      (d) momentum

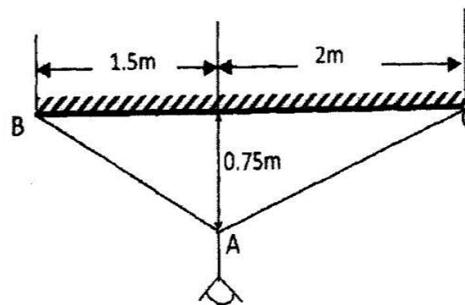
9. The coefficient of friction depends on CO5- R
- (a) Area of contact (b) shape of surfaces
- (c) Strength of surfaces (d) nature of surface
10. Frictional force encountered after commencement of motion is called CO5- R
- (a) Post friction (b) limiting friction (c) Kinematic friction (d) dynamic friction

PART – B (5 x 2= 10 Marks)

11. Define Kinetics and Kinematics. CO1- R
12. Explain the Type of Support. CO2- U
13. What is uniform motion? CO3- U
14. State D’Alembert’s principle CO4- U
15. State the laws of Dynamic friction? CO5- R

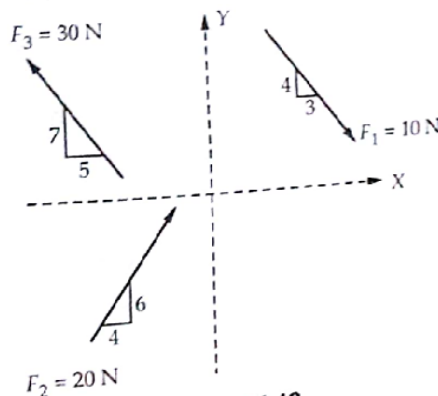
PART – C (5 x 16= 80 Marks)

16. (a) The following figure shows a 10 kg lamp supported by two cables AB and AC. Find the tension in each cable CO1-App (16)
- AB and AC. Find the tension in each cable

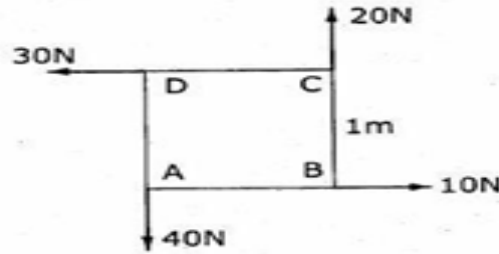


Or

- (b) Find X and Y Component of given Force CO1-App (16)

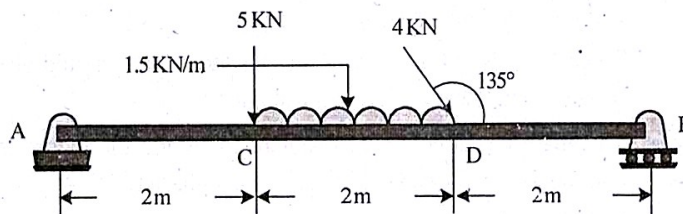


- 17 (a) Four forces act on a square of side 1 m as shown in fig. Predict the force system into an equivalent force –couple system at A. CO2-App (16)

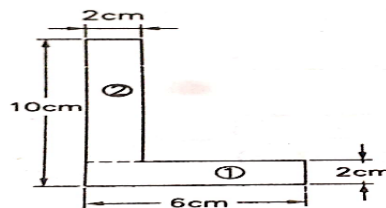


Or

- (b) A simply supported beam AB of 6m span is loaded as shown A is a hinged support; B is a roller support. Determine the reactions at A and B. CO2-App (16)

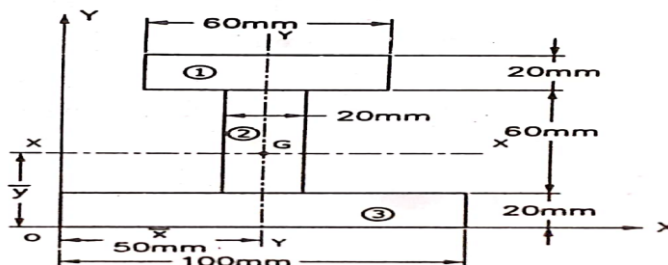


- 18 (a) Locate the centroid of the L-section. CO3-App (16)



Or

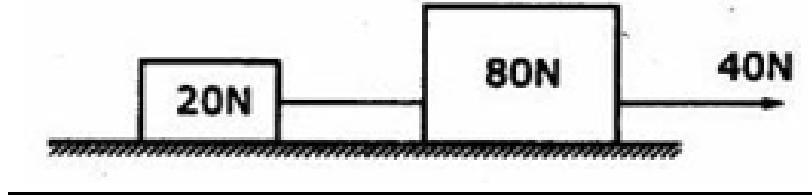
- (b) Calculate the Principal Moment of Inertia and Locate the Principal Axes of an unequal I- section about centroid axes. CO3-App (16)



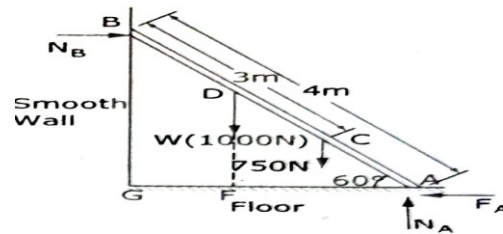
- 19 (a) A Burglar's car had a start with acceleration of  $2 \text{ m/s}^2$ . A police vigilant party came after 5 second and continued to chase the Burglar's car with a uniform velocity of  $20 \text{ m/s}$ . Find the time taken in which the police van will overtake the Burglar's car? CO4-App (16)

Or

- (b) Two weights 80 N and 20 N are connected by a thread and move along a rough horizontal plane under the action of a force 40 N, applied to the first weight of 80 N as shown in figure. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Design the acceleration of the weights and the tension in the thread using work-energy equation. CO4-App (16)



- 20 (a) A uniform ladder of weight 1000 N and of length 4m rests on a horizontal ground and leans against a smooth vertical wall. The ladder makes an angle of 60° with horizontal. When a man of weight 750 N stands on the ladder at a distance 3m from the top of the ladder, the ladder is at the point of sliding. Determine the co-efficient of friction between the ladder and the floor. CO5-App (16)



Or

- (b) What should be the value of the angle  $\theta$  so that the motion of the 90 kN blocks impends downward? The coefficient of friction for all the surfaces is  $1/3$ . CO5-App (16)

