Code No.: ME208ES | R20 | H.T.No. | | | 8 | R | | | | | |

CMR ENGINEERING COLLEGE: : HYDERABAD
UGC AUTONOMOUS
I–B.TECH–II–Semester End Examinations (Supply) - January- 2022
ENGINEERING MECHANICS
(MECH)

[Time: 3 Hours] **[Max. Marks: 70]**

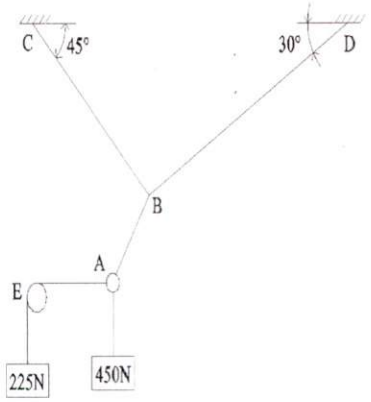
Note: This question paper contains two parts A and B.
Part A is compulsory which carries 20 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A **(20 Marks)**

1. a) A force of magnitude 500N is passing through the origin and a point A (0.2, 1, 0) m. write the couple form of the force. [2M]
   b) State the principal of transmissibility of forces with sample sketch. [2M]
   c) Laws of dynamic friction? [2M]
   d) Define angle of friction and angle of repose and give one example [2M]
   e) Define mass moment of inertia and give one example? [2M]
   f) Give any two difference between parallel and perpendicular axis theorem [2M]
   g) A body moves along a straight line so that its displacement from a fixed point on the line is given by $s = 4t^2 - 5t$. Find the velocity and acceleration at the end of 3 seconds. [2M]
   h) A particle of mass 5kg falls vertically from a height of 50m from ground. What is the change in potential energy when it has reached a height of 50m? [2M]
   i) State D'alembert's principle give on practical example? [2M]
   j) Define instantaneous center? Give one example? [2M]

PART-B **(50 Marks)**

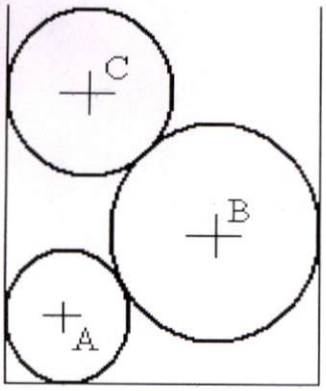
2. a) Explain various supports and support reactions. [5M]
   b) Find the tensions in the three cables connected to B. The entire system of cables is coplanar.The roller at E is free to turn without resistance. [5M]



OR

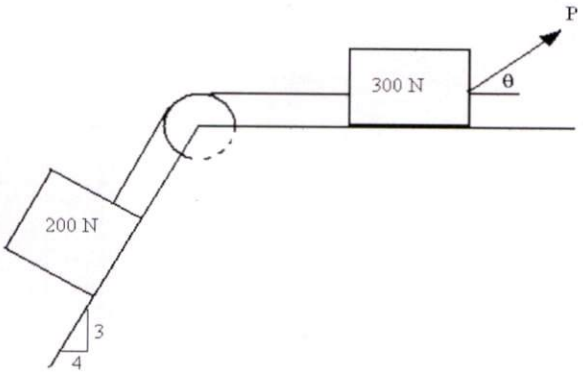
3. a) State the lami`s theorem and explain its limitations. [5M]

b) Three Cylinders are piled in a rectangular ditch of width 0.18 m as shown in Fig. Neglecting friction, Determine the reaction between cylinder A and the Vertical Wall. Take W_A= 150 N, W_B = 400 N, W_C = 200 N, R_A = 40 mm, R_B = 60 mm, R_C = 50 mm [5M]



4. a) Explain the Ordinary screw jack and its working principle with a neat diagram. [5M]

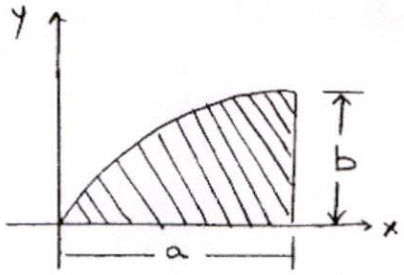
b) Determine the least value of 'P' to cause the motion to impend rightward. The coefficient of friction under each block is 0.25 and the pulley to be frictionless. [5M]



OR

5. A ladder 5m long and of 250N weight is placed against a vertical wall in a position where its inclination to the vertical is 30^o. A man weighing 800N climbs the ladder. At what position will he induce slipping? The co-efficient of friction for both the contact surfaces of the ladder viz. with the wall and the floor is 0.2 [10M]

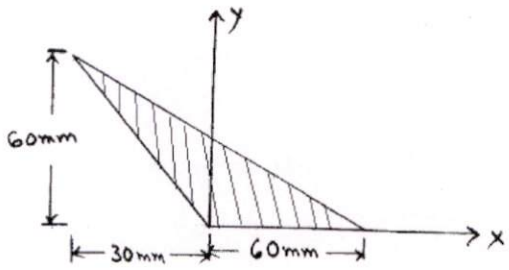
6. From first principle deduce the expression to Locate the centroid of given parabola $y^2 = kx$ [10M] bounded by x- axis the line x = a.



OR

7. a) state and prove parallel axis theorem for moment of inertia [5M]

   b) Determine the moment of inertia of the shaded triangular area as shown in figure with respect to X-Y axis [5M]



8. a) The motion of a particle in rectilinear motion is defined by the relation $s = 2t^3 - 9t^2 + 12t - 10$ where s is expressed in metres and t in seconds. Find (i) the acceleration of the particle when the velocity is zero (ii) the position and the total distance traveled when the acceleration is zero. [5M]

   b) A flywheel executes 1500 revolutions while it coasts to rest from a speed of 5000 rpm. Assume uniformly accelerated motion; determine (i) the time required for the fly wheel to coast to rest (ii). The time required for the flywheel to execute the first 750 revolutions. [5M]

OR

9. a) An automobile driven at 15 m/s for 720 sec, then at 18 m/s for 1200 sec, and finally at 23 m/s for 480 sec. What is the average speed over this interval? [5M]

   b) A ball is thrown vertically into the air at 37 m/s. After 3 sec another ball is thrown vertically. What initial velocity must the second ball have to pass the first ball at 30m from the ground [5M]

10. A car A car of weight 2100kg starts from rest at point A on a 6° incline and coasts through a distance of 140m to point B. The brakes are then fully applied, causing the automobile to skid to a stop at point c, 18m from B. The coefficient of dynamic friction between the tires and the road is 0.75, determine the work done on the automobile by the combined effects of air resistance and rolling resistance between points A and C. [10M]

OR

11. a) A weight is dropped from a position just above, but not touching, a spring. Show that the maximum deformation produced will be twice that if the same weight were gradually lowered upon the spring. [10M]

b) An elevator weighing 18 kN is lowered at a constant rate of 3 m/s when the hoisting drum is suddenly stopped. If the elastic properties of the supporting cable are such that it is equivalent to a spring with a modulus of 350 kN/m, determine by how many times the sudden stop of the hoisting drum momentarily increases the cable tension.

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