

Sr. No:MU-205 D 18

Dec 2018

B.Tech III SEMESTER

Engineering Mechanics (MU-205)

Time: 3 Hours

Max. Marks:60

- Instructions:**
1. It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.
 2. Answer any four questions from Part -B in detail.
 3. Different sub-parts of a question are to be attempted adjacent to each other.
 4. All missing data may be suitably assumed.

PART -A

- 1 (a) Determine the angles made by the vector $V = 40i - 30j$ with the positive X and Y axes. 2
(b) What is Principle of Transmissibility of the force? 2
(c) Differentiate between cross and dot product of two vectors. 2
(d) Draw the FBD of the given figure 1. 2
(e) What is conservative force? Give two examples. 2
(f) What is tensor? 2
(g) A car starting from rest is accelerated at the rate of 0.4 m/s^2 . Find the distance covered by the car in 20 seconds. 2
(h) What is application of cylindrical coordinate system of a vector? 2
(i) What is Chasles theorem? 2
(j) A body of 10 kg attains a speed 20 m/s from 10 m/s in 2 seconds. How much force is applied on the body? 2

Part B

- 2 (a) Forces F_1 and F_2 act on the bracket as of their resultant R onto the b-axis, shown in fig 2. Determine the projection F_b .

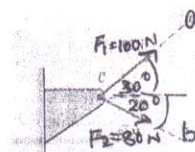


Fig2

- (b) 50 N force P is applied to the perpendicular portion of BC of bent bar of Fig 3. Determine the moment of B and A

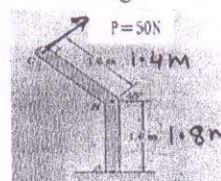


Fig3

- 3 (a) The cylinder P has diameter of 100 mm and weighs 200 N, as shown in fig 4, whereas the cylinder Q has diameter of 180 mm and weighs 500 N. If the bottom width of the box is 180 mm, with one side vertical and the other inclined at 60° , determine the pressures at all the four points of contact.

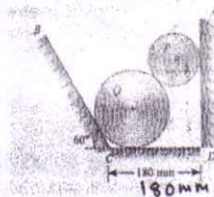


Fig 4

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- (b) The uniform 7-m steel shaft has a mass of 200 kg and is supported by a ball and-socket joint at A in the horizontal floor as shown in Fig5. The ball end B rests against the smooth vertical walls as shown. Compute the forces exerted by the walls and the floor on the ends of the shaft.

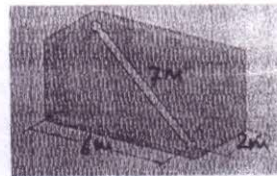


Fig5

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- 4 (a) Determine the moments of inertia of a triangular area about its base and about parallel axes through its centroid and vertex.

(b) What is Parallel axis theorem of Moment of Inertia?

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- 5 (a) A particle, starting from rest, moves in a straight line, whose equation of motion is given by: $s = t^3 - 2t^2 + 3$. Find the velocity and acceleration of the particle after 5 seconds

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(b) State and prove the three laws of motion.

5

- 6 (a) Plane A is flying at 700 KMPH and acceleration 50 Km/h^2 along a straight line path, whereas plane B is flying at 600 KMPH and acceleration 100 Km/h^2 along a circular path having radius of curvature 400 Km. Determine the velocity and acceleration of B as measured by the pilot of A.

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(b) A Block slides down over a 30° inclined plane with an initial velocity 2 m/s. Determine the velocity in 3 second, if the coefficient of friction between block and plane is $\mu_k = 0.5$.

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- 7 (a) What do you understand by the term 'energy'? What do understand by conservation of Energy?

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(b) A uniform ladder, 5 metres long rests at A and against a smooth wall at B as shown in Fig 6, weighing 200 N, A horizontal rope PQ prevents the ladder from slipping. Using the method of virtual work, determine the tension in the rope.

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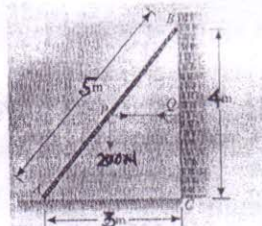


Fig 6
