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Univ. Roll No.....

Program: B.Tech. (Batch 2018 onward)

Semester: 3rd

Name of subject: Engineering Mechanics

Subject Code: ESME-101

Paper ID: 16071

MORNING

09 MAY 2023

Time Allowed: 3 Hours

Max. Marks: 60

NOTE:

- 1) Parts A and B are compulsory
- 2) Part C has Two questions Q8 and Q9. Both are compulsory, but with internal choice.
- 3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

- a) Define Lami's theorem.
- b) Explain concept of couple with neat sketch.
- c) Explain Static Friction.
- d) Give statement of Newton's second Laws of Motion.
- e) What is centre of mass?
- f) Describe the phenomenon of combined motion of rotation and translation with examples.

Part- B

[Marks: 04 each]

Q2. What is free body diagram, explain its importance with neat sketch.

Q3. Find the moment of inertia of a rectangular section 30 mm wide and 40 mm deep about X-X axis and Y-Y axis.

Q4. Explain types of equilibrium.

Q5. A car is travelling on a level track of radius 50 m. Find the maximum speed, at which he can travel on the curved track, if the coefficient of friction between the tyres and track is 0.45. Take $g = 9.8 \text{ m/s}^2$.

Q6. Find the centroid of an unequal angle(L) section $100 \text{ mm} \times 80 \text{ mm} \times 20 \text{ mm}$.

Q7. A train of 1500kN weight develops a power of 35kW while moving down a slope of 1 in 150 at a uniform speed of 18kmph. What power is required if the train is to go up the slope with the same speed?

Part- C

[Marks: 12 each]

Q8 A bullet of mass 20 g is fired horizontally with a velocity of 300 m/s, from a gun carried in a carriage, which together with the gun has mass of 100 kg. The resistance to sliding of the carriage over the ice on which it rests is 20 N. Find (a) velocity, with which the gun will recoil, (b) distance, in which it comes to rest, and (c) time taken to do so.

OR

P.T.O.

Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes

Prove the parallel axis theorem in the determination of moment of inertia of areas with the help of a neat sketch.

Q9. A railway coach, having ordinary cross-seats, is travelling at 4 m/s. A person runs at 5 m/s on the platform. In what direction, he must run so that he may enter the railway coach parallel to the seats? Also find the velocity with which he enters the coach.

OR

What is a wedge? State its uses and the method of solving the problems on wedge friction.

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