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Reg. No. : .....

Name : .....

Combined First and Second Semester B.Tech. Degree Examination, April 2015
(2008 Scheme)
08-105 : ENGINEERING MECHANICS
(CMNPHETARUFBS)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. State and prove Varignon's theorem.
2. Explain the different types of supports and different types of loadings in a beam.
3. Explain :
   i) Cone of friction
   ii) Lami's theorem.
4. Define :
   i) Centre of gravity
   ii) Centroid and
   iii) Radius of gyration.
5. Explain instantaneous centre of rotation.
6. Distinguish between uniform rotation and uniformly accelerated rotation.
7. What is meant by impulse of a force ? State the impulse momentum principle.
8. Define :
   i) Amplitude of oscillation
   ii) Time period
   iii) Frequency of oscillation.

(5×8 = 40 Marks)

P.T.O.

PART – B

Answer **two full** questions from **each** Module.

Module – I

9. The resultant of two forces P and Q acting at a point is R. If Q is doubled, R is also doubled and if the direction of Q is changed (reversed) R is again doubled. Prove that $P : Q : R = \sqrt{2} : \sqrt{3} : \sqrt{2}$. **10**

10. A force of 300 N acts through point P (1, 6, – 5) and directed towards Q (0, 4, 3). Find the moment of the force about a point A (1, 0, – 1). Assume distances are in meters. **10**

11. Find the minimum value of horizontal force P applied to block A that will keep the system in equilibrium. Angle of friction for all contact surfaces is 12° (Fig. 1) **10**

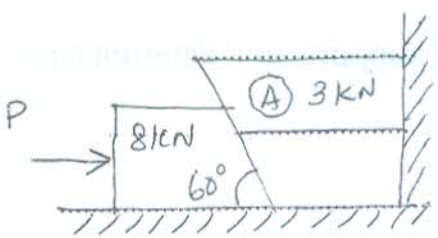

Fig. 1

Module – II

12. Determine the moment of inertia of the area about the centroidal horizontal axis. (Fig. 2). **10**

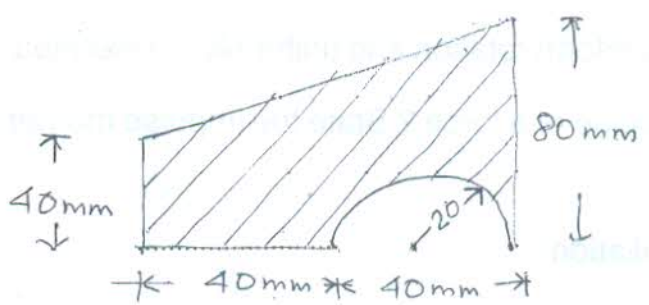

Fig. 2

13. A railway coach having ordinary cross seats is travelling at 14.4 km/hr. A person runs at 5 m/sec on the platform. In what direction he must run so that he may enter parallel to the seats. Also find the velocity with which he will enter. **10**

14. A car starts from rest on a curved road of 250 m radius and accelerates at a constant tangential acceleration of 0.5 m/sec^2. Determine the distance and time that the car will travel before the magnitude of its total acceleration is 0.65 m/sec^2. **10**

Module – III

15. A glass ball is dropped on to a smooth horizontal plane from which it bounces to a height of 9 cm on the second bounce it rises to a height of 6 cm. From what height was the ball dropped ? What is the coefficient of restitution between the glass and plane ? **10**

16. A man of mass 70 kg stands in an aluminium canoe of mass 35 kg. He fires a bullet of mass 25 gm horizontally over the bow of the canoe to hit a wooden block of mass 2.25 kg resting on a smooth horizontal surface. If the wooden block and the bullet together move with a velocity of 5 m/sec. find the velocity of the canoe. **10**

17. A body is moving with simple harmonic motion and has velocities of 8 m/sec. and 3 m/sec. at distances of 1.5 m and 2.5 m respectively from the centre. Find the amplitude and time period of the body. **10**