C 15007 (Pages : 4) Name.....

Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, MAY 2011

PTEN/EN 09 105—ENGINEERING MECHANICS

(2009 admissions)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What are the specifications of force ?
2. What are the equations of equilibrium for a system of concurrent forces in a plane ?
3. Define static friction.
4. State Newton's second law of motion.
5. What is a rigid body ?

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Compute the reactions at the supports A and B of the beam loaded as shown in Fig 1, if q_a = 100 N/m and q_b = 200 N/m.

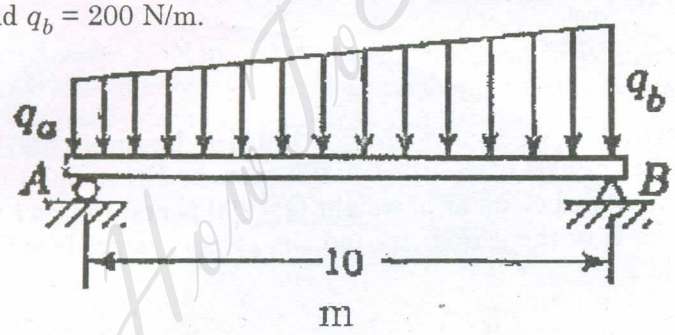

Fig 1

7. A body of weight 500 N is lying on a rough plane inclined at an angle of 25° with the horizontal. It is supported by an effort (P) parallel to the plane as shown in Fig. 2. Determine the minimum and maximum values of P, for which the equilibrium can exist, if the angle of friction is 20°.

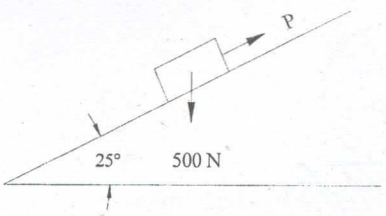

Fig.2

Turn over

8. Determine the moment of inertia of a solid cylinder of radius R and length L about an axis through the center of gravity G and perpendicular to the axis of cylinder.

9. Two balls are projected from the same point in directions inclined at 60° and 30° to the hor If they attain the same maximum height, find the ratio of their velocities of projection.

10. A railway wagon of weight 4 kN is moving with a velocity of 25 m/sec. A force of 200 N acts wagon for 2 minutes. Calculate the velocity of the wagon, if the direction of the applied fo (i) in the direction of motion ; and (ii) in the opposite direction.

11. A rigid body rotates about a fixed axis and slows down from 300 r.p.m. to 150 r.p.m. in 2 m Determine (i) the angular acceleration ; (ii) the number of revolutions completed in 2 minu

(4 × 5 = 20)

Part C

Answer Section (a) **or** *(b) of each question.*
Each question carries 10 *marks.*

12. (a) Determine the magnitude, direction, and position of the line of action of the resultant coplanar system of forces shown in Fig. 3.

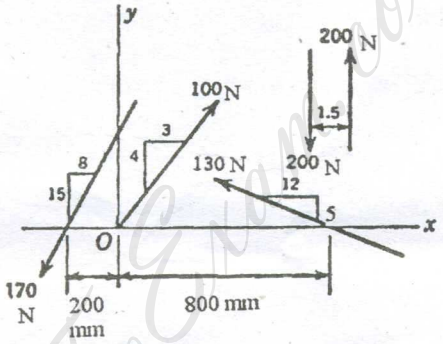

Fig 3

Or

(b) Two smooth circular cylinders, each of weight W = 100 N and radius r = 60 mm., are conn at their centers by a string AB of length l = 160 mm. and rest upon a horizontal p supporting above them a third cylinder of weight Q = 200 N and radius r = 60 mm. as sl in Fig. 4. Find the force S in the string AB and the pressures produced on the floor a points of contact D and E.

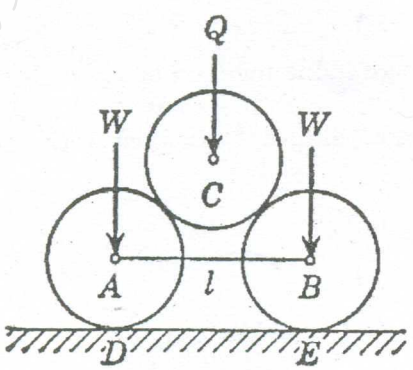

Fig. 4

13. (a) Find the forces in members BE, CE and BD for the truss shown in Fig. 5.

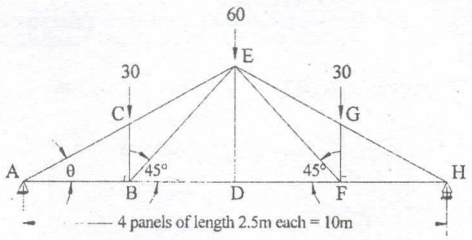

Fig.5

Or

(b) Calculate the moment of inertia of the section shown in Fig. 6 about the '*xx*' and '*yy*' a through the centroid.

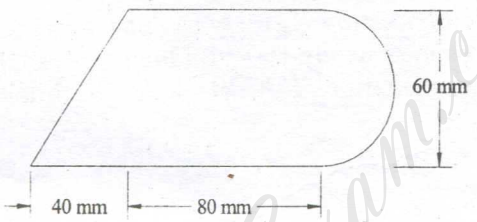

Fig.6

14. (a) A body P weighing 10 N moves vertically downwards as shown in Fig. 7 and is connected a string with another body Q weighing 12N which slides over a horizontal surface. Neglecti inertia of the pulley friction on its axle and extensibility of the string find the acceleration the falling weight P. The coefficient of friction between the block Q and the horizontal pla is 0.4.

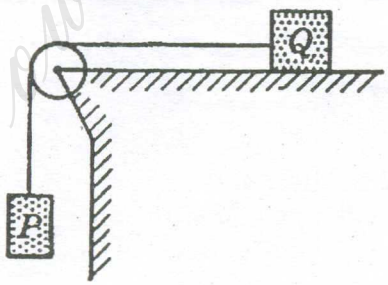

Fig.7

Or

(b) A bullet is fired with an initial velocity of 40 m/sec. from a point 20 m. in front of a vertical w 10 m. high. Find the angle of projection with horizontal to enable the bullet to clear the wa

Turn ov

15. (a) A cord is wrapped around the inner core of a spool as shown in Fig. 8. If the cord is pulled wi a constant force of 300 N and if the cord wrapped around the outer core is attached to a blo of mass 8 kg, determine the angular acceleration of the spool and the tension in the co connected to block B. The spool has a mass of 25 kg. and a radius of gyration with respect the axis of rotation of 150 mm.

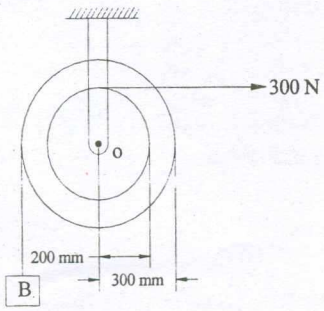

Fig.8

Or

(b) A cord passes over a mass less and frictionless pulley as shown in Fig. 9, carrying a block A c mass 175 kg. at one end and wrapped around a cylinder of mass 250 kg., which rolls on horizontal plane. Determine (i) acceleration of the block A ; (ii) tension in the cord.

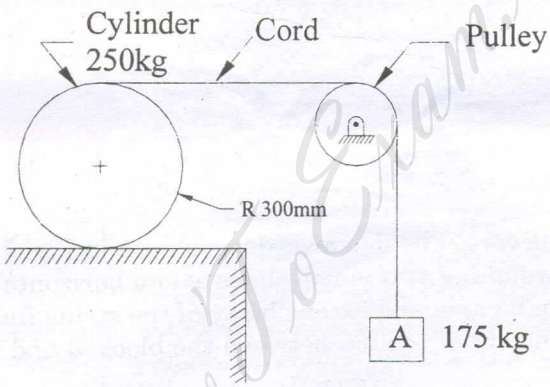

Fig.9

(4 × 10 = 40 marks)