C 60700

(Pages : 4)

COMBINED FIRST AND SECOND SEMESTER B.TECH. (ENGINEERING) DEGREE EXAMINATION, APRIL 2014

(2009 Scheme)

PTEN/EN 09 105—ENGINEERING MECHANICS

Time : Three Hours

Maximum : 70 Marks

Part A

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

1. Distinguish between Equilibrant and Resultant.
2. Define angle of repose.
3. List any three useful effects of friction.
4. State Pappus-Guldinus theorems.
5. What is Chasle's theorem ?

(5 × 2 = 10 marks)

Part B

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

6. State the following laws/theorems of mechanics,
   (a) Theorem of three forces.
   (b) Law of superposition.
7. State and prove the parallel axis theorem.
8. State Coulomb's Law's of friction.
9. A ball of mass 250 gm is dropped from a height of 4 m on a horizontal floor. The ball rebounds to a height of 1.75 m after the impact. Determine the Coefficient of restitution between the ball and the floor.
10. A ball is thrown vertically upwards with an initial velocity of 18m/sec. Find the (a) time taken to reach the maximum height ; (b) The maximum height ; and (c) the final velocity when it strikes the ground.
11. Derive the expression for the second moment of area of a rectangular cross-section of a base b and depth d about the centroidal axis parallel to the base.

(4 × 5 = 20 marks)

Turn over

Part C

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

12. (a) An automobile is pulled by means of two trucks as shown in Figure 1. If the resultant of the two forces acting on the automobile is 25 kN being directed along the positive direction of X- axis, determine the angle θ of the cable attached to the track at B such that the force F_B in this cable is minimum. What is the magnitude of force in each cable when this occurs ?

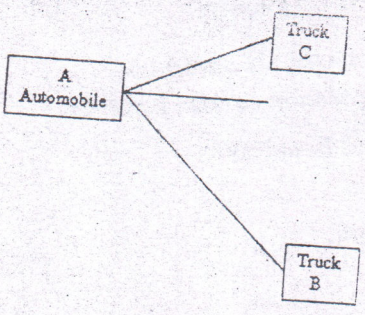


Figure 1

Or

(b) If the tension in wire 'AB' is 75 kN determine the required values of tensions in 'AC' and 'AD', so that the resultant of the three forces applied at 'A' is vertical as shown in Figure 2. Find also the resultant.

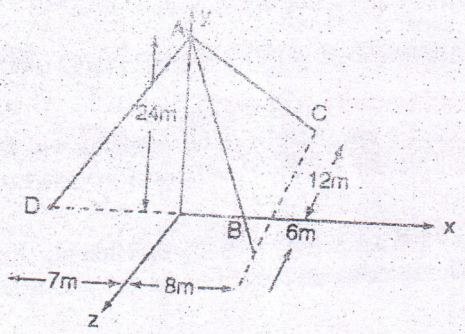
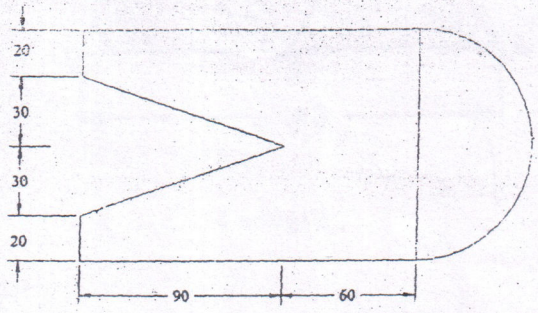


Figure 2

13. (a) An effort of 200 N is required to just move a body up an inclined plane of angle 15°, the forces acting parallel to the plane. If the angle of inclination of the plane is made 20°, the effort required, applied parallel to the plane is found to be 230 N. Find the weight of the body and the coefficient of friction.

Or

(b) Calculate the moment of inertia of the section shown in Figure 3 about the centroidal axes.



All dimensions are in mm.

Figure 4

14. (a) Draw shear force bending moment diagrams for the simply supported beam shown in Figure 4.

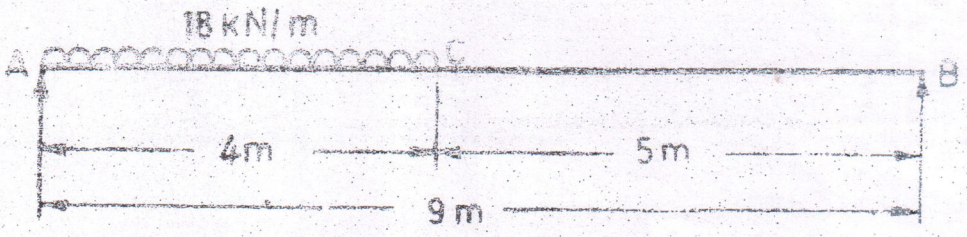


Figure 4

Or

(b) Find the forces in the various members of the frame shown in Figure 5.

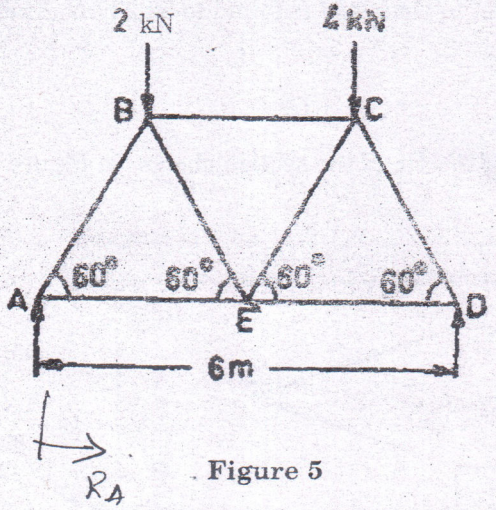


Figure 5

15. (a) Find the power of locomotive drawing a train whose weight is 600 kN up an incline 1 in 100 at a steady speed of 4.5 km/h. Assume frictional resistance to be 8 N per 1000 N.

Or

(b) A body weighing 196.2 N slides up a 30° inclined plane under the action of an applied force 300 N acting parallel to the inclined plane. The coefficient of friction is 0.2. The body moves from rest. Determine :

(i) Acceleration of the body.

(ii) Kinetic energy of the body after 4 seconds.

(iii) Work done on the body in 4 seconds.

(iv) Impulse applied in 4 seconds.

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Name : .....

Reg. No: .....

COMBINED FIRST AND SECOND SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2013

EN 04 107 (A) – ENGINEERING MECHANICS (A)

Time : Three Hours

Maximum : 100 Marks

Answer all questions. Each carries 5 marks.

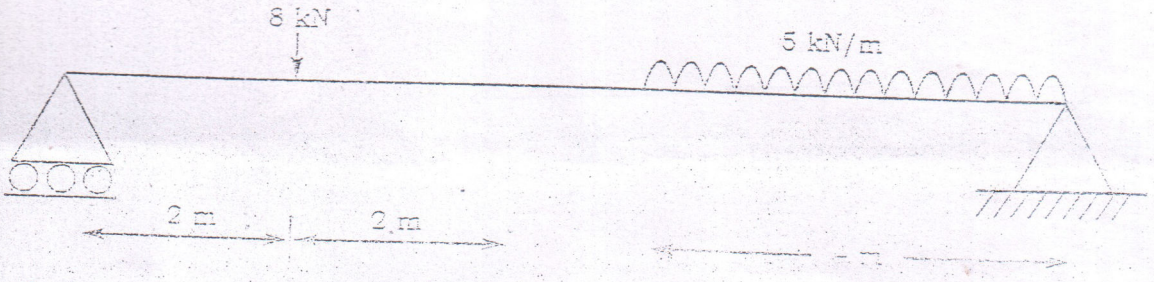
I 1. State the principle of transmissibility of a force.

2. Explain non coplanar concurrent forces and non coplanar noncurrent forces with example and figure.

3. Explain with a diagram the method of determination of M.I. of a sold sphere about its diameter.

4. State and explain theorem of parallel axis and perpendicular axis.

5. Find support reactions of the beam shown below.



6. A ball of mass 5 kg is dropped from a height of 10 cm on to a spring of stiffness 500 N/m. Find the maximum compression of the spring.

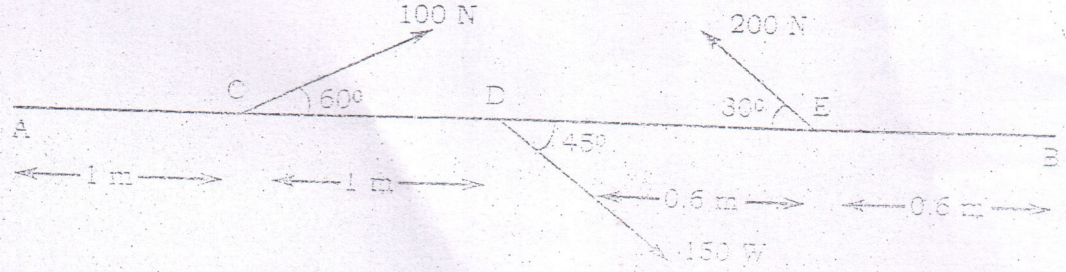
7. Explain D' Alembert's principle applicable to curvilinear motion.

8. The point of application of a force $F = 6i + 9j - 10k$ is displaced from the point $(1 + 3k)$ to the point $(2i - J - 2k)$. Find the work done by the force.

(8 x 5 = 40 Marks)

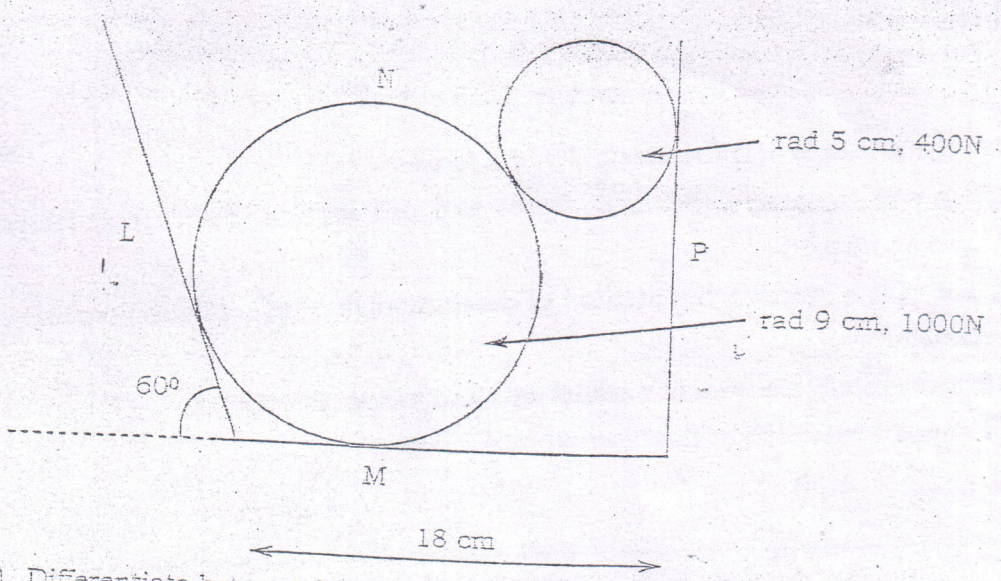
Answer all questions. Each carries 15 marks.

II (a) Three coplanar non-concurrent forces are acting at C, D and E as shown in fig. They are to be balanced by one vertical force at A and another force at B. Find the magnitude of the force at A and the force at B.



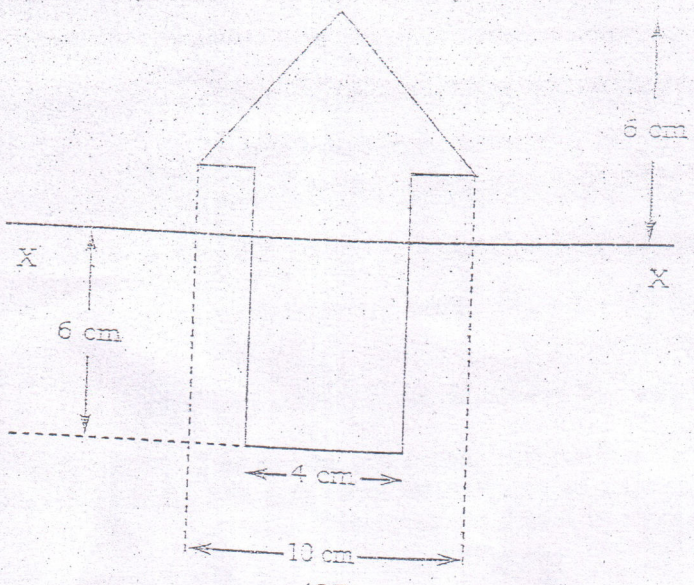
(OR)

(b) Find the reactions at the supports L, M, N and P for the system shown in Fig.



III (a) (i) Differentiate between M.I. and Polar M.I.

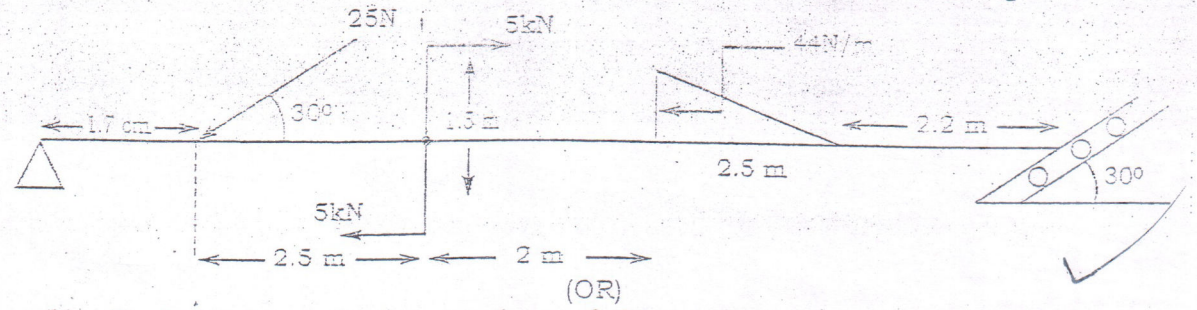
(ii) Determine the moment of Inertia of the section about XX passing through the centroid.



(OR)

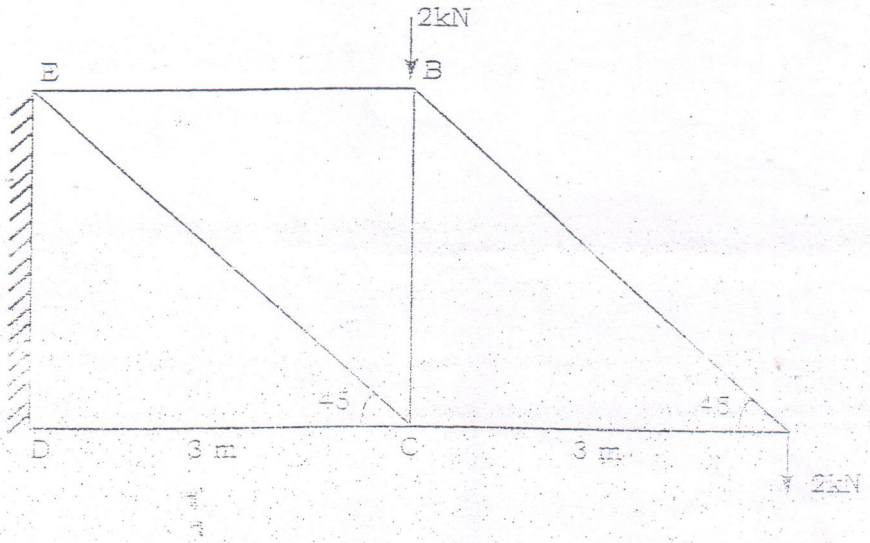
(b) Derive an expression for the MI of a solid cylinder about an axis normal to the length and passing through the center.

IV (a) Find the reaction at the supports of the beam loaded as shown in Fig.



(OR)

(b) Find the forces in the members of the truss shown in Fig. and tabulate the results.



V (a) Find the acceleration of the system using D'Alembert's principle if a force of 300N acts on a body of mass 150 kg.

(OR)

(b) A lift has an upward acceleration of 1.225 m/s². What force will a man weighing 500 N exerts on the floor of the lift? What force would be exert, if the lift had an acceleration of 1.225m/s² downwards? What upward acceleration would cause his weight to exert a force of 600N on the floor?

(4 x 15 = 60 Marks)

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Reg. No.....

COMBINED FIRST AND SECOND SEMESTER B.TECH (ENGINEERING) DEGREE EXAMINATION, ARPIL 2013

EN/PTEN 09 105—ENGINEERING MECHANICS

(2009 Scheme—Regular/Supplementary/Improvement)

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

1. What is a statistically indeterminate problem ?
2. State parallel axis theorem.
3. State the second theorem of Pappus-Guldinus.
4. Define work-energy principle.
5. State the equations of motion for rotation.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*

6. An electric-light fixture of weight Q (40N) is supported as shown in Fig. 1. Determine the tensile forces S_1 and S_2 in the wires BA and BC if their angles of inclination are as shown.

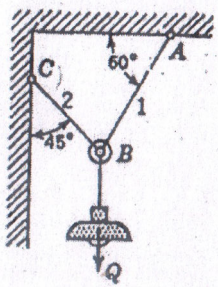

Fig. 1.

7. An inclined plane as shown in Fig. 2. is used to unload slowly a heavy safe weighing 400N from a truck 1.2 m high into the grounds. The coefficient of friction between the bottom of the safe and the plank is 0.30. State whether it is necessary to push the safe down the plane or hold it back from sliding down.

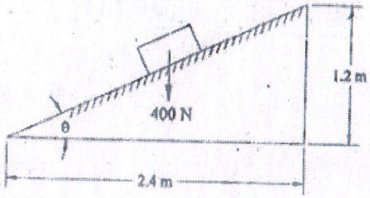

Fig. 2.

Turn over

8. Find the mass moment of inertia of the cylinder shown in Fig. 3 with respect to the z-axis.

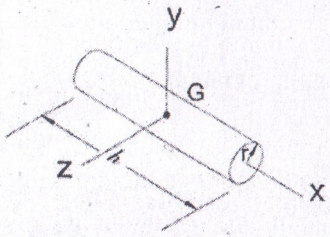

Fig. 3.

9. An aircraft, moving horizontally at 108 km/hr at an altitude of 1000 m releases a bomb toward target on the ground which hits it. Estimate the horizontal distance of the aircraft from the tar when it released the bomb. Calculate also the velocity and direction with which the bomb hits target. Neglect air friction.
10. A motorist is travelling on a curved portion of a highway of radius 400 m at a speed of 0 km/hr. brakes are suddenly, applied, causing the speed to decrease at a constant rate of 1.5 m/s^2. Determ the magnitude of the automobile (a) immediately after the brakes have been applied (b) 3 seconds later.
11. A pelton wheel is rotating at 40 rad/sec when the power is turned off. If it takes 25 seconds for wheel to come to rest, determine (a) the constant angular deceleration and (b) the total numbe revolutions the wheel makes.

(4 × 5 = 20 ma

Part C

Answer section (a) **or** *section* (b) *of each question.*

12. (a) The following forces act at a point :
    (i) 20 N inclined at 30° towards North of East.
    (ii) 25 N towards North.
    (iii) 30 N towards North West, and
    (iv) 35 N inclined at 40° towards South of West.

    Find the magnitude and direction of the resultant force.

    Or

    (b) A horizontal beam AB of length 4 m is hinged to a vertical wall at A and supported at its midpoint C by a tie rod CD as shown in Fig. 4. Find the tension S in the tie rod and the reaction at A due to a vertical load P (50N) applied at B.

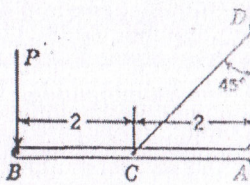

Fig. 4.

13. (a) Find the forces in members of the truss shown in Fig. 5.

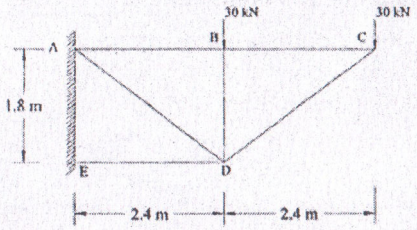

Fig. 5.

Or

(b) Find the moment of inertia about the centroidal axes for the section shown in Fig. 6

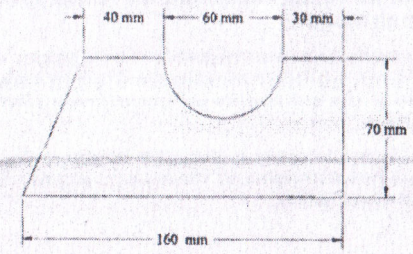

Fig. 6.

14. (a) Two blocks of weights A (150 N) and B (50 N) are connected by a string and passes over a frictionless pulley as shown in Fig. 7. Determine the acceleration of blocks A and B and the tension in the string.

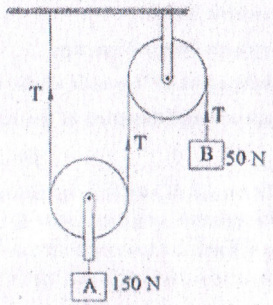

Fig. 7.

Or

(b) A soldier fires a bullet at an angle of 30° (upward from the horizontal) from his position to strike a target which is 61 m lower than the position of the soldier. The initial velocity bullet is 91.5 m/sec. Calculate (a) the maximum height to which the bullet will raise abo horizontal. (b) the actual velocity with which it will hit the target. (c) the total time re for the flight of the bullet.

15. (a) A pulley with two loads, connected by an inextensible cord is shown in Fig. 8. If the moves downward with an initial velocity of 1.5 m/sce, and uniform acceleration of 0.75 determine (i) number of revolutions executed by the pulley in 2 sec. (b) velocity and po of the load A after 2 sec.

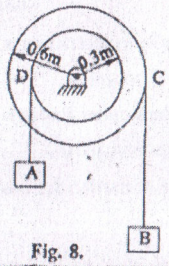

Fig. 8.

Or

(b) A block of 500 N is suspended by a tight rope wound round the pulley of weight 200 radius 0.5 m, as shown in Fig. 9. Determine the acceleration of the weight and the tens the rope.

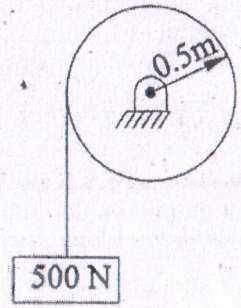

Fig. 9.

(4 × 10 = 40 m

C 14983 (Pages 3) Name.....

Reg. No.....

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

EN 04 107 (A)—ENGINEERING MECHANICS (A)

(For CE, AI, CH, CE, CS, EE, EC, IT, IC, BM, BT, PT)

Time : Three Hours Maximum : 100 Marks

Answer **all** *questions.*

Part A

Each question carries 5 marks.

I. (a) State and prove Lami's theorem.

(b) Explain the different types of forces with neat sketch.

(c) State the factors influencing friction.

(d) What are prinicipal axes and principle moments of inertia ?

(e) Define the term 'support reaction'. Describe the analytical as well as graphical methods for finding out the support reactions of a beam carrying vertical loads only.

(f) What is a plane truss ? What are the assumptions made in the analysis of plane trusses ?

(g) State and prove the working energy equation.

(h) State and prove the D'Alembert's Principle.

(8 × 5 = 40 marks)

Part B

II. (a) An automobile is pulled by means of trucks as shown in Figure 1. If the resultant of the two forces acting on the automobile is 25 kN being directed along the positive direction of X-axis, determine the angle θ of the cable attached to the track at B such that the force F_B in this cable is minimum. What is the magnitude of force in each cable when this occurs ?

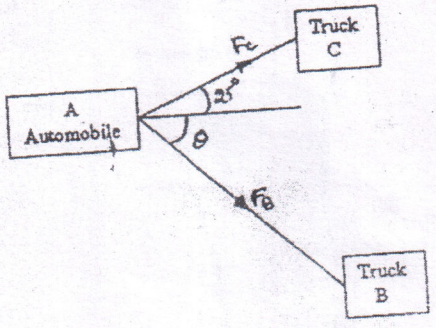

Fig.1.

Or

Turn over