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Question Paper Code : 27275

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to all branches except Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering, Computer and Communication Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Medical Electronics and Information Technology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Polygon law of forces.
2. State the equations of equilibrium of a coplanar system of forces.
3. Give the different types of support in beams.
4. Define principle of transmissibility.
5. State the theorems of Pappus and Guldinus to find out the surface area and volume of a body.
6. Write the expression for centroid of hemisphere and circular lamina.
7. What is the frictional force generated when a body of mass 10kg resting on a horizontal plane subjected to a horizontal force p in earth gravitational field, if the coefficient of friction is 0.25.
8. A body of weight 150N rest on a horizontal plane. If a horizontal force of 50N can just move it, then what will be the value of coefficient of friction.
9. A small ball is dropped from a height of 19.62 m. At what velocity the ball will strike the ground.
10. Define instantaneous centre of rotation.

PART B — (5 × 16 = 80 marks)

11. (a) A system of four forces acting on a body is as shown in Fig. 11 (a). Determine the resultant forces and its direction. (16)

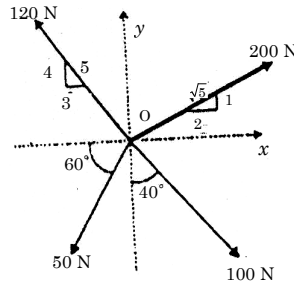


Fig. 11 (a)

Or

- (b) Determine the tension in the cables AB and AC required to hold the 40kg crate as shown in Fig. 11 (b) (16)

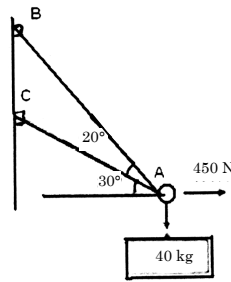


Fig. 11 (b)

12. (a) A frame supported at A and B is subjected to a force of 500 N as shown in Fig. 12(a). Compute the reactions at the support points for the cases of $\theta = 0^\circ, \theta = 60^\circ, \theta = 90^\circ$. (16)

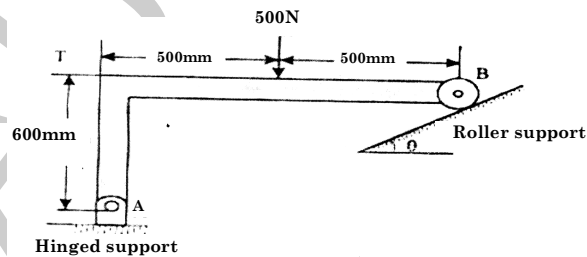


Fig. 12 (a)

Or

- (b) Find the support reactions of the beam loaded as shown in Fig.12 (b). (16)

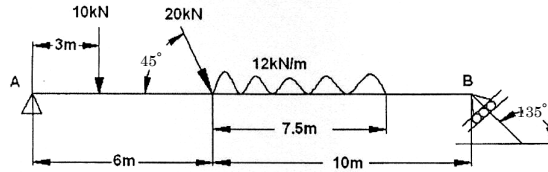


Fig. 12 (b)

13. (a) For the plane area shown in Fig. 13(a), locate the centroid of the area. (16)

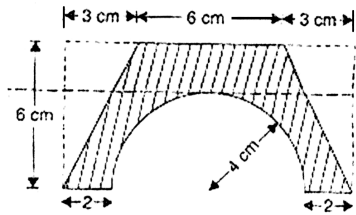


Fig. 13(a)

Or

- (b) Find the Moment of Inertia of the section shown in Fig. 13(b) about horizontal and vertical axes through the centroid. Also determine the principle moment of inertia. (16)

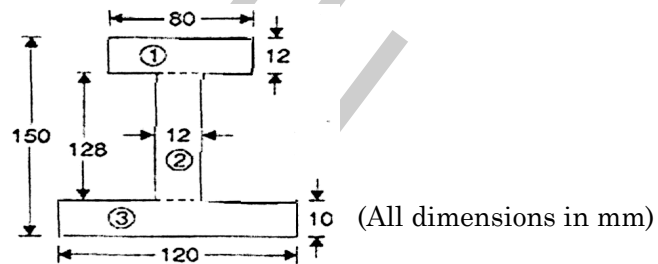


Fig. 13(b)

14. (a) (i) Define angle of friction and angle of repose. (4)
 (ii) A ladder is 8 m long and weighs 300. The centre of gravity of the ladder is 3m along the length of ladder from the bottom end. The ladder rests against a vertical wall at B and on the horizontal floor at A as shown in Fig. 14 (a). Determine the safe height up to which a man weighing 900N can climb without making the ladder slip. The co-efficient of friction between ladder and floor is 0.4 and ladder top and wall is 0.3. (12)

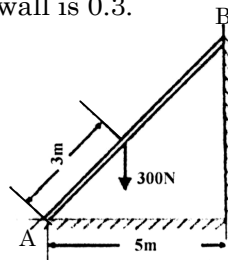


Fig. 14 (a)

Or

- (b) (i) A car starts from rest and accelerates uniformly to a speed of 80 kmph over a distance of 500m. Find time and acceleration. Further acceleration raises the speed to 96 kmph in 10 seconds. Find the acceleration and distance. Brakes are applied to bring the car to rest under uniform retardation in 5 seconds. Find the distance covered during braking. (8)
- (ii) A projectile is thrown with a velocity of 5 m/s at elevation of 60° to the horizontal. Find the velocity of another projectile thrown at an elevation of 45° which will have (1) equal horizontal range (2) equal maximum height (3) equal time of flight with the first. (8)
15. (a) The two blocks of mass 20kg and 40kg are connected by a rope passing over a friction less pulley as shown in Fig. 15(a). Assuming co-efficient of friction as 0.3 for all contact surfaces. Find the tension in the string, acceleration of the system. Also compute the velocity of the system after 4 second starting from the rest. (16)

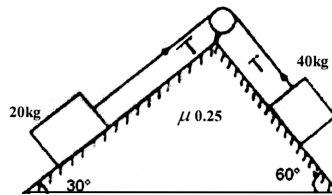


Fig. 15(a)

Or

- (b) An inextensible string passing over a smooth pulley as shown in Fig. 15(b) joining two blocks. If the blocks are released simultaneously from rest, determine the velocity of block A after it has moved over 2 m and the tension in the string. Assume the co-efficient of friction at the contact surface is 0.2 . Use energy principle. (16)

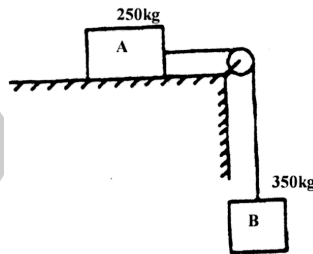


Fig. 15(b)

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Question Paper Code : 57415

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Second Semester

Civil Engineering

GE 6253 T – ENGINEERING MECHANICS

(Common to Mechanical Engineering)

(Regulations 2013)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Two forces 30 N and 40 N act at a point 'O'. The included angle between them is 60°. Find the magnitude and the direction of the resultant.
2. What are the minimum requirements for equilibrium of a particle in space ?
3. How free body diagram is constructed ?
4. State Varignon's theorem.
5. State Pappus-Guldinus theorem.
6. When will the product of inertia of an area become zero ?
7. State D'Alembert's principle.
8. What happens if two perfectly elastic bodies are in impact ?
9. What is angle of repose ?
10. A motor bike wheel of radius 80 cm is moving along a straight road with a speed of 60 km/hr. Find the angular speed of the wheel.

PART – B (5 × 16 = 80 Marks)

11. (a) (i) Two forces P and Q of magnitude 40 N and 60 N respectively act on a bolt A. Determine their resultant if P and Q makes 20° and 45° respectively with horizontal.

- (ii) Two forces are applied to a hook support as shown in Fig. 11. (a)(ii) Knowing that the magnitude of P is 35 N determine (1) the required angle α if the resultant R of the two forces applied to the support is to be horizontal, (2) the corresponding magnitude of R. (12)

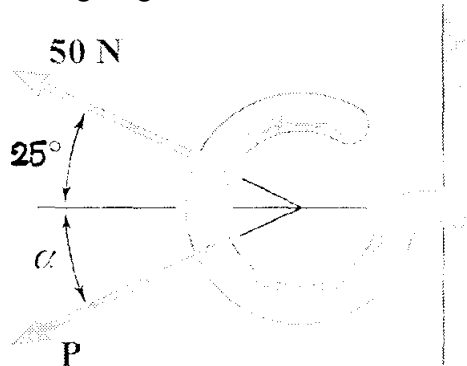


Fig. 11 (a) (ii)
OR

- (b) The x, y, z component of a force are 36 kN, -24 kN and 24 kN respectively. Find the component of this force along the line joining A (1, 2, -3) and B (-1, -2, 2).
12. (a) A bracket is subjected to a force as shown in Fig. 12 (a). Determine : (i) an equivalent force couple system at A and B. (ii) an equivalent system consisting of 90 kN force at B and another force at A.

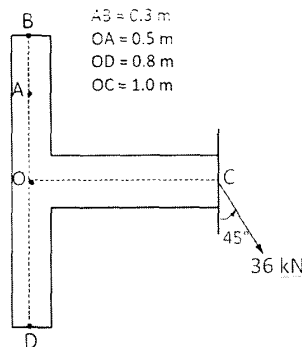


Fig. 12 (a)
OR

- (b) A fixed crane has a mass of 1000 kg and is used to lift a 2400 kg crate as shown in Fig. 12(b). It is held in place by a pin at A and a rocker at B. The center of gravity of the crane is located at G. Determine the reactions at supports A and B.

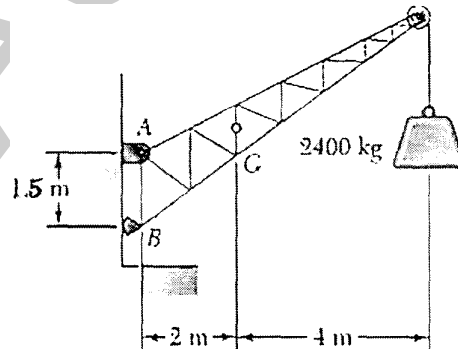


Fig. 12 (b)

13. (a) Locate the centroid for Area shown in Fig. 13 (a).

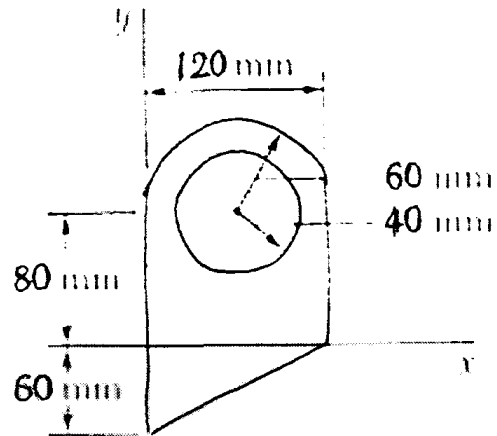


Fig. 13 (a)

OR

- (b) Determine the moment of inertia for the area shown in Fig. 13 (b) about the centroidal x and y axes.

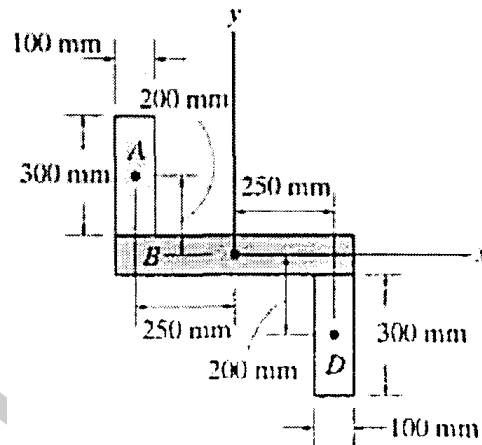


Fig. 13(b)

14. (a) A stone is projected with a speed of 30 m/s at an angle of elevation of 50° . Find its velocity (i) after 2 seconds, (ii) at the highest point of its path, (iii) at the height of 6 m. Find also the time interval between two points at which the stone attains a speed of 23 m/s.

OR

- (b) Two blocks 'A' and 'B' of masses $m_A = 280 \text{ kg}$ and $m_B = 420 \text{ kg}$ are joined by an inextensible cable as shown in Fig. 14(b). Assume that pulley is frictionless and $\mu = 0.3$ between block A and the surface. If the system is initially at rest, determine the velocity of the blocks after it has moved 3.5 m. Use Work Energy principle.

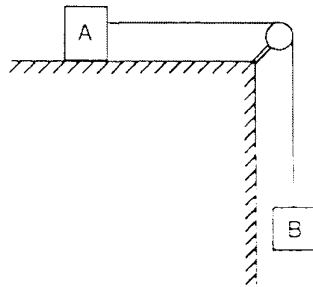


Fig. 14 (b)

15. (a) A ladder of weight 390 N and 6m long is placed against a vertical wall at an angle of 30° as shown in Fig. 15(a). The co-efficient of friction between the ladder and the wall is 0.25 and between ladder and floor is 0.38. Find how high a man of weight 1170 N can climb without sliding.

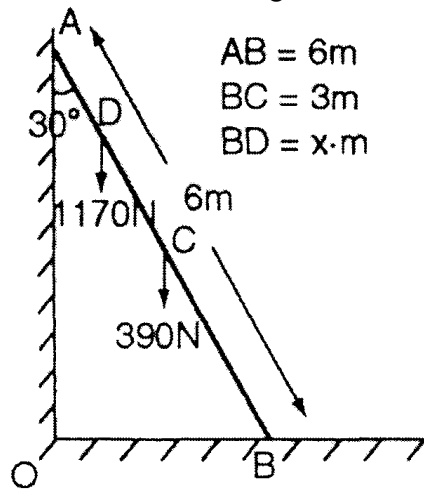


Fig. 15 (a)

OR

- (b) A bar AB of length 5 m slides in the xy plane as shown in Fig. 15(b). The velocity of point A is 10 m/s downwards and makes an angle 60° with vertical. Determine the velocity of point B and mid point C.

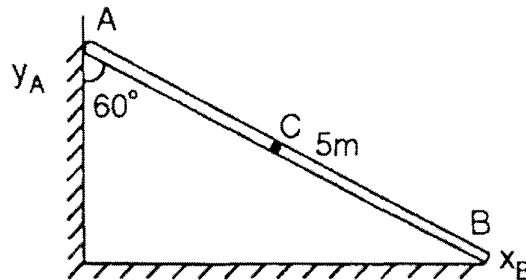


Fig. 15 (b)

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Question Paper Code : 71945

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Second Semester

Civil Engineering

GE 6253 – ENGINEERING MECHANICS

(Common to Mechanical Engineering (Sandwich), Aeronautical Engineering, Agriculture Engineering, Automobile Engineering, Civil Engineering, Environmental Engineering, Geoinformatics Engineering, Industrial Engineering, Industrial Engineering and Management, Manufacturing Engineering, Marine Engineering, Materials Science and Engineering, Mechanical Engineering, Mechanical and Automation Engineering, Mechatronics Engineering, Petrochemical Engineering, Production Engineering, Robotics and Automation Engineering, Chemical Engineering, Chemical and Electrochemical Engineering, Fashion Technology, Food Technology, Handloom and Textile Technology, Petrochemical Technology, Petroleum Engineering, Pharmaceutical Technology, Plastic Technology, Polymer Technology, Textile Chemistry, Textile Technology, Textile Technology(Fashion Technology))

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the principle of transmissibility.
2. Find the resultant and direction of Force $\vec{F} = 3i - 4j$.
3. Differentiate between moment and couple.
4. A uniform ladder of weight 'W' leans against a vertical wall. Assuming the contact surfaces as rough, draw the free body diagram of the ladder with necessary assumptions.
5. Differentiate between center of gravity and centroid.
6. State parallel axis theorem as applied to area Moment of Inertia.
7. The displacement of a particle is given by $S = 3t^2 + 2t$ meters. Where 't' is in seconds? Find the velocity and acceleration when t = 10 seconds.
8. State the principle of work-energy.

9. What is dry friction?
 10. What is general plane motion? Give one example.

PART B — (5 × 16 = 80 marks)

11. (a) Two cylinders C, F of diameter 60mm and 30mm. weighing 160 N and 40 N respectively are placed as shown in Fig. 11(a). Assuming all the contact surfaces to be smooth, find the reactions at A, B and C.

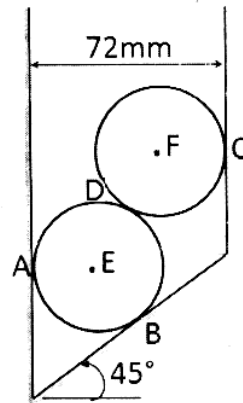


Fig. 11(a)

Or

- (b) Forces 32 kN, 24 kN, 24 kN and 120 kN are concurrent at origin (0,0,0) and are respectively directed through the points whose coordinates are A(2, 1, 6), B(4, -2, 5), C(-3, -2, 1) and D(5, 1, -2). Determine resultant of the system.
12. (a) Four tug boats are used to bring a large ship to its pier. Each tug boat exerts a 5000N force in the direction as shown in Fig. 12(a). Determine the equivalent force-couple system at point 'O', and the point on hull where a single more powerful tugboat should push to produce the same effect as the original four tugboats.

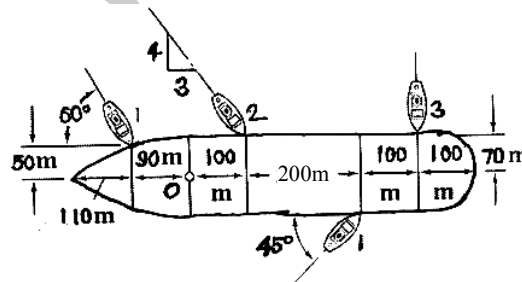


Fig. 12(a)

Or

- (b) A light bar AD is suspended from a cable BE and supports a 50 kg block at C as shown in Fig. 12(b). The ends A and D of the bar are in contact with frictionless vertical walls. Determine the tension in cable BE and the reactions at A and D.

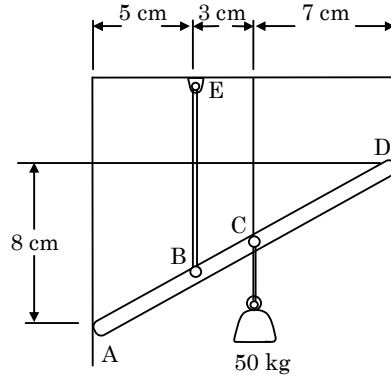


Fig. 12(b)

13. (a) Determine the location of centroid for the right angle triangle from the first principles and find the volume of cone using Pappus-Guldinus theorem.

Or

- (b) Calculate the moment of inertia of the section shown in Fig. 13(b) about "x" and "y" axes through the centroid.

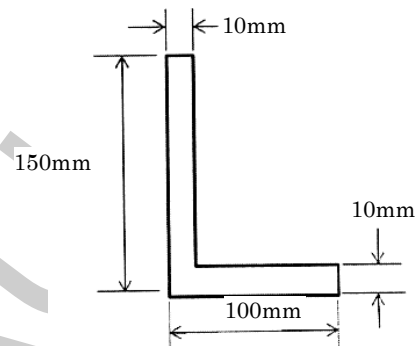


Fig. 13(b)

14. (a) A body moving with uniform acceleration is observed to travel 33 m in 8th second and 53 m in 13th second of its travel. Calculate the velocity at start and uniform acceleration.

Or

- (b) Two blocks 'A' and 'B' of masses $m_A = 280$ kg and $m_B = 420$ kg are joined by an inextensible cable as shown in Fig. 4(b). Assume that the pulley is frictionless and $\mu = 0.30$ between block 'A' and the surface. The system is initially at rest. Determine (i) acceleration of block A: (ii) velocity after it has moved 3.5 m; and (iii) velocity after 1.5 seconds.

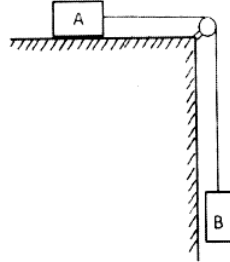


Fig. 14 (b)

15. (a) A 100 N force acts on a 300N block placed on an inclined plane as shown in Fig. 15(a). The coefficients of friction between the block and the plane are $\mu_s = 0.25$ and $\mu_k = 0.20$. Determine whether the block is in equilibrium, and find the value of the friction force.

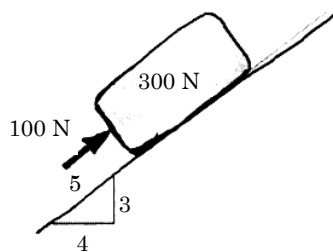


Fig. 15 (a)

Or

- (b) A wheel is attached to the shaft of an electric motor of rated speed of 2000 rpm. When the power is switched on, the wheel attains the rated speed in 10 seconds and when the power is switched off, the unit comes to rest in 100 seconds. Assume uniformly accelerated motion and determine the number of revolutions the unit turns (i) to attain the rated speed and (ii) to come to rest.

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Question Paper Code : 77163

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to all branches except Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering, Computer and Communication Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Medical Electronics and Information Technology)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A vector \vec{F} starts at point (2, -1, 2) and passes through the point (-1, 3, 5). Find its unit vector.
2. State the principle of transmissibility.
3. List the different supports used to support structural components.
4. Find the magnitude and location of the single equivalent force for a beam AB of length 8 m having a point C at 3 m from A subjected to the following forces :
 - (a) An upward force of 10 N at A
 - (b) A downward force of 10 N at C
 - (c) An upward force of 40 N at B
5. Find the radius of gyration of a rectangular area of MI about its base $9 \times 10^4 \text{ cm}^4$ and cross sectional area 300 cm^2 .
6. State perpendicular axis theorem.
7. A particle is projected into space at an angle of 30° to the horizontal at a velocity of 40 m/s. Find the maximum height reached by the projectile.

8. Distinguish between perfectly plastic impact and perfectly elastic impact.
9. What is angle of repose?
10. A wheel of radius 50 cm subjected to a load of 300 N rolls on a level ground at constant speed. If the wheel is pushed by a tractive force of 60 N applied horizontally at the centre of the wheel, find the coefficient of rolling resistance.

PART B — (5 × 16 = 80 marks)

11. (a) (i) The magnitude of the resultant of two concurrent forces including an angle of 90° between them is $\sqrt{13}$ kN. When this included angle is changed to 60° , the magnitude of the resultant becomes $\sqrt{19}$ kN. Find the magnitude of the two forces. (12)
- (ii) A force of magnitude 3.5 kN makes 30° , 50° and 100° with x , y and z axes respectively. Find the force vector and determine its components along x , y , z axes. (4)

Or

- (b) A weight of 8 kN is suspended by three cables PA , PB and PC . The co-ordinates of the points are :

| | | |
|--------------------|--------------|------|
| $P(1.5, 1, 5, -2)$ | $A(0, 3, 4)$ | |
| $B(2.5, 3, 2.5)$ | $C(1, 3, 0)$ | (16) |

Determine the tensions in the cables.

12. (a) A roller of radius 30 cm weighs 2.5 kN. It is to be pulled over a rectangular obstruction of height 10 cm by a horizontal force F passing through the centre of the roller. Find the magnitude if the force F passing through the centre of the roller. Find the magnitude if the force F required just to turn the roller over the corner of the obstruction. Also find the magnitude and direction of the minimum force required for the same. (16)

Or

- (b) (i) A body of mass 900 kg is suspended by two cables PR and PQ making an angle of 40° and 50° respectively with the ceiling. Find the tension in the cables PQ and PR . (8)
- (ii) A father and his son carry a block of mass 50 kg by using a uniform bar of length 3 m and mass 16 kg. The son can bear only half the load carried by the father. Find the location of the block on the bar. (8)

13. (a) (i) A solid hemisphere of density 2ρ is attached centrally to a solid cylinder of density ρ . Find the height of the cylindrical portion to have the CG of the solid combination on the axis of symmetry at the junction between the hemisphere and the cylinder. Take the cylinder diameter as 100 mm. (12)
- (ii) Find the polar moment of inertia of a hollow circular section of outer diameter 80 mm and inner diameter 40 mm about an axis through its centroid. (4)

Or

- (b) Find the MI of an I section about XX and YY axes through its centroid. Dimensions are : Top flange: 150 mm \times 12 mm Web : 200 mm \times 10 mm, Bottom flange : 150 mm \times 12 mm. (16)
14. (a) (i) A particle is projected into space at an angle of 40° to the horizontal reaches the highest point in 3 seconds. Find the projection velocity and range. (6)
- (ii) A block of mass 8 kg is dragged up an inclined plane by a rope inclined at 15° to the plane while the plane is inclined at 30° to the horizontal. Find the velocity of the block after 4 seconds if dragged from rest. Take the co-efficient of kinetic friction between the block and the plane as 0.2. Also assume that a force of 100 N is applied through the rope for dragging the block upwards the plane. Apply impulse momentum equation. (10)

Or

- (b) (i) A boy drops a stone from the top of well vertically downwards into it. The splash is heard by him after 6 seconds. Find the well depth taking sound velocity as 400 m/s. (10)
- (ii) A car of mass 500 kg moving at a speed of 80 km/hr to the right collides with a lorry of mass 1,500 kg which is at rest. After the impact, the lorry moves at a speed of 36 km/hr to the right. Find the velocity of the car after impact. Also find the coefficient of restitution. (6)
15. (a) Two rough planes are joined together one of them is horizontal and the other is inclined at 45° to the horizontal. A 100 kg block is on the inclined plane and is connected to a 60 kg block on the horizontal plane through a cable passing over a smooth pulley at the junction of the planes. A dragging force of A is applied on 60 kg block at an angle of θ to the horizontal. Find the magnitude of the force and the value of θ for the motion is about to start. Assume $\mu = 0.25$. (16)

Or

- (b) A homogeneous sphere of mass m_1 and radius r_1 and a homogeneous cylinder of mass m_2 and radius r_2 roll along an incline without slipping. They start from rest at the top and reach the bottom at different times which of the two reaches the bottom earlier? (16)

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| Question Paper Code : 80506 |
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B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to Mechanical Engineering (Sandwich) Aeronautical Engineering, Agriculture Engineering, Automobile Engineering, Civil Engineering, Environmental Engineering, Geoinformatics Engineering, Industrial Engineering, Manufacturing Engineering, Industrial Engineering and Management, Marine Engineering, Materials Science and Engineering, Mechanical Engineering, Mechanical and Automation Engineering, Mechatronics Engineering, Petrochemical Engineering, Production Engineering, Robotics and Automation Engineering, Chemical Engineering, Chemical and Electro Chemical Engineering, Fashion Technology, Food Technology, Handloom Technology, Petrochemical Technology, Petroleum Engineering, Pharmaceutical Technology, Plastic Technology, Polymer Technology, Textile Chemistry, Textile Technology, Textile Technology (Fashion Technology)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Lami's theorem.
2. Define the principle of transmissibility of force.
3. Differentiate between couple and moment.
4. Write the equations of equilibrium of a rigid body in two dimensions.
5. Define 'centroid of a plane area'.
6. What do you understand by mass moment of inertia?
7. Define linear momentum and angular momentum.
8. Give the equation of work energy for a rectilinear motion.
9. Distinguish between dry and fluid friction.
10. What is general plane motion?

PART B — (5 × 16 = 80 marks)

11. (a) A horizontal line PQRS is 12 m long, where PQ = QR = RS = 4m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R, S respectively in downward direction. The line of action of these forces makes angle of 90°, 60°, 45° and 30° respectively with PS. Find the magnitude, direction and position of resultant force. (16)

Or

- (b) A light string ABCDE whose extremity A is fixed, has weights W_1 and W_2 attached to it at B and C. It passes round a small smooth peg at D carrying a weight of 300 N at the free end E as shown in Fig. 11.b. If in the equilibrium position, BC is horizontal and AB and CD make 150° and 120° with BC, find (i) Tensions in the portion AB, BC and CD of the string and (ii) Magnitudes of W_1 and W_2 . (16)

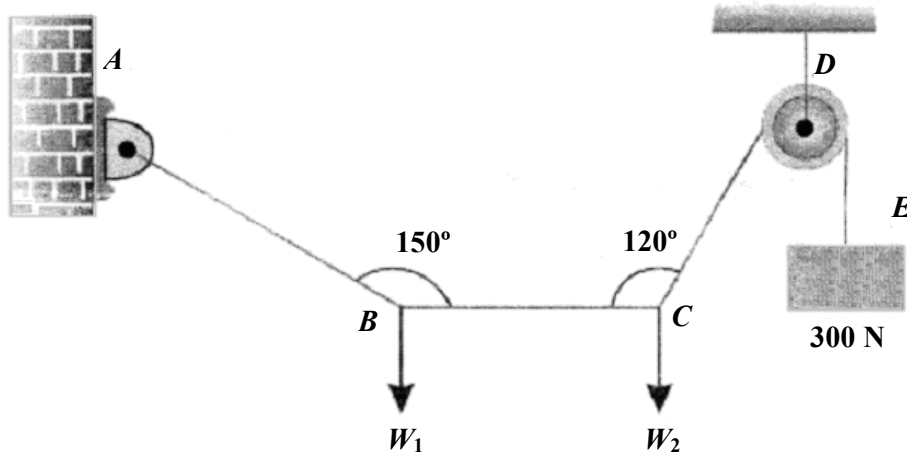


Fig. 11.b

12. (a) A fixed crane (Fig. 12.a) has a mass of 1000 kg and it is used to lift a 2400 kg weight. It is held in place by a pin at A and a rocker at B. The centre of gravity of the crane is located at G. Determine the components of reaction at A and B. (16)

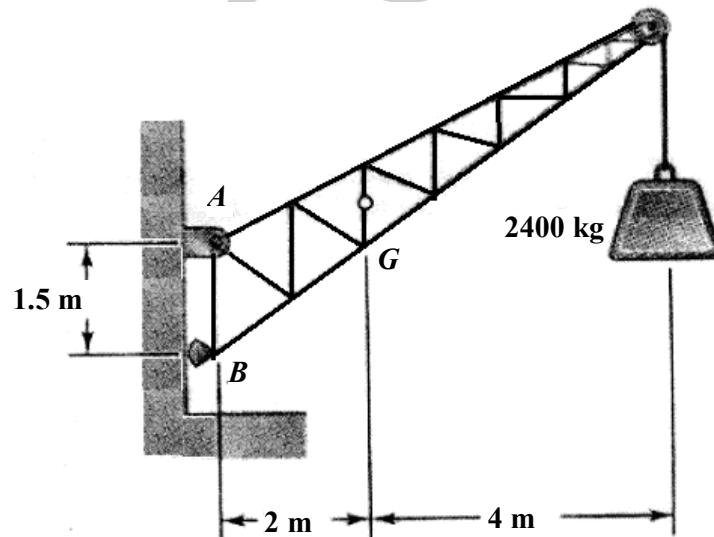


Fig. 12.a

Or

- (b) The frame (Fig. 12.b) supports the part of the roof of a small building. The tension in the cable is 150 kN. Determine the reaction at the fixed end E. (16)

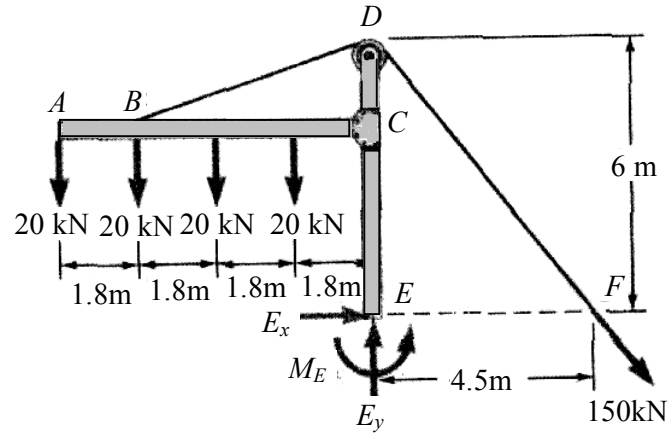


Fig.12.b

13. (a) A uniform lamina shown in Fig. 13.a. consists of a rectangle, a semi-circle and a triangle. Determine the centroid of the lamina. (16)

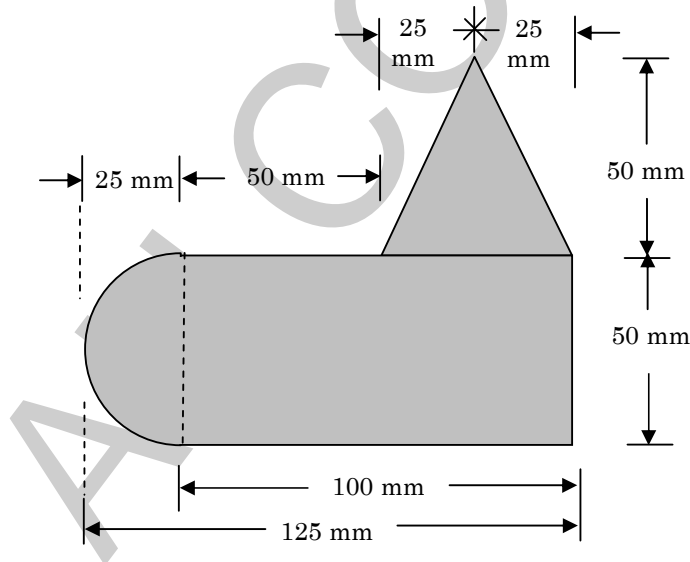


Fig.13.a

Or

- (b) Find the area moment of inertia of the T section, shown in Fig. 13.b. (16)

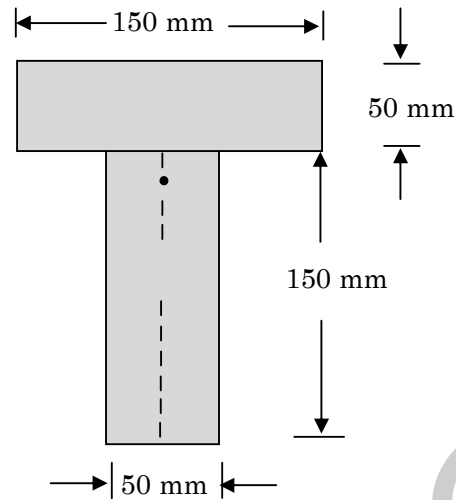


Fig. 13.b

14. (a) A bullet of mass is fired horizontally with a velocity of 300 m/s, from a gun carried in a carriage; which together with the gun has a mass of 100 kg. The resistance to sliding of the carriage over the ice on which it rests is 20 N. Find (i) Velocity, with which the gun recoils. (ii) Distance, in which it comes to rest (iii) Time taken to come to rest. (16)

Or

- (b) A mass 10kg travelling towards right with a speed of 25 m/s collides with another mass 20 kg travelling in the same direction with a speed of 9 m/s. If the co-efficient of restitution is 0.6, find the velocities of masses after collision and loss in kinetic energy. What is the impulse on either mass? (16)
15. (a) A load of 1.5 kN, resting on an inclined rough plane, can be moved up the plane by a force of 2 kN applied horizontally or by a force 1.25 kN applied parallel to the plan. Find the inclination of plane and coefficient of friction. (16)

Or

- (b) A ladder 5m long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900 N and acts at the middle. The ladder is at the point of sliding, when a man is weighing 750 N stands on a rung 1.5 m from the bottom of the ladder. Calculate the coefficient of friction between the ladder and the floor. (16)

Reg. No. :

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Question Paper Code : 97232

B.E./B.Tech. DEGREE EXAMINATION, DECEMBER 2015/JANUARY 2016.

Second Semester

Civil Engineering

GE 6253 — ENGINEERING MECHANICS

(Common to all branches except Electrical and Electronics Engineering, Electronics and Instrumentation Engineering, Instrumentation and Control Engineering, Biomedical Engineering, Computer and Communication Engineering, Computer Science and Engineering, Electronics and Communication Engineering, Medical Electronics and Information Technology)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the length of the line joining the origin with the point (2,1, - 2).
2. State triangle law of forces.
3. Distinguish between the resultant and equilibrant.
4. Find R_A and R_B of the beam shown in Fig. 4.

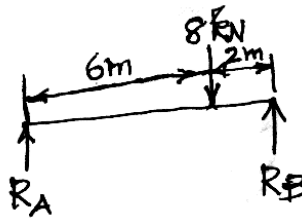


Fig. 4

5. A right angled triangle of base 3 m and height 4 m is revolved about its 4 m vertical edge. Compute the volume of the solid generated.
6. Write an expression for the radius of gyration of an area.
7. A train running at 80 km/h is brought to a standing halt after 50 seconds. Find the retardation.
8. What is dynamic equilibrium?
9. What is impulsive force?
10. State the principle of work and energy for the general plane motion of rigid bodies.

PART B — (5 × 16 = 80 marks)

11. (a) A system of five forces of magnitude 4 kN, 5 kN, 6 kN, 7 kN and 8 kN acts at one of the angular points of a regular hexagon and the forces pass through the other angular points as shown in Fig. 11(a). Find the magnitude and direction of the resultant of the system of forces.

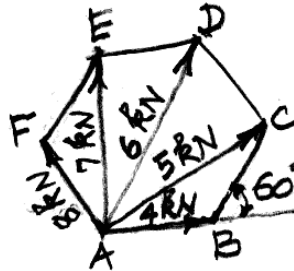


Fig. 11 (a)
Or

- (b) A system of forces acts as shown in Fig. 11(b). Find the magnitude of A and B so that the resultant of the force system passes through P and Q.

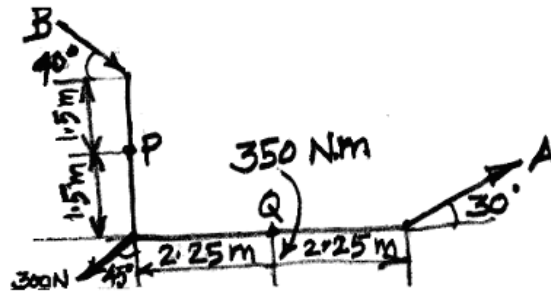


Fig. 11(b)

12. (a) Three links PQ, QR and RS connected as shown in Fig. 12(a) support loads W and 50 N. Find the weight W and the force in each link if the system remains in equilibrium.

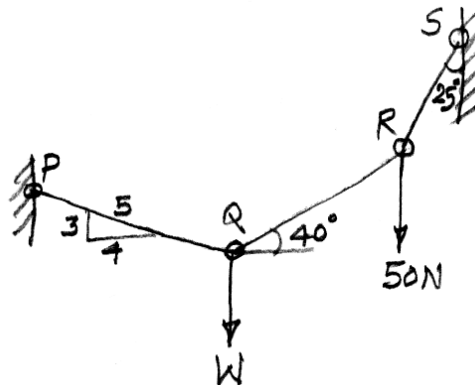


Fig. 12(a)
Or

- (b) Find the support reactions of the truss loaded as shown in Fig. 12(b).

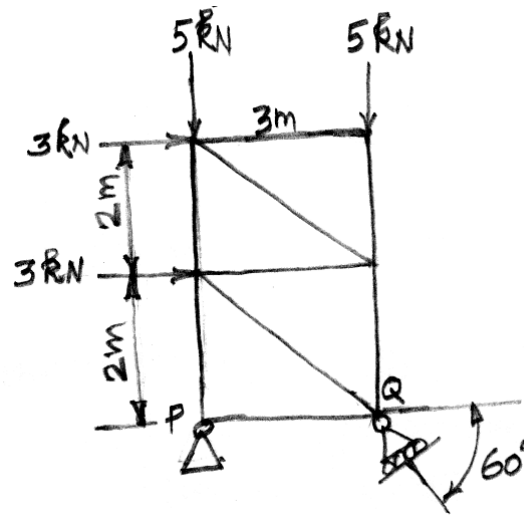


Fig. 12(b)

13. (a) A cone of base diameter 200 mm is fitted to a hemisphere of diameter 200 mm centrally. What should be the height of cone so that the centroid of the solid combination lies at the junction between the cone and hemisphere?

Or

- (b) Find the moment of inertia of the section shown in Fig. 13(b) about the x and y centroidal axes. All dimensions are in mm.

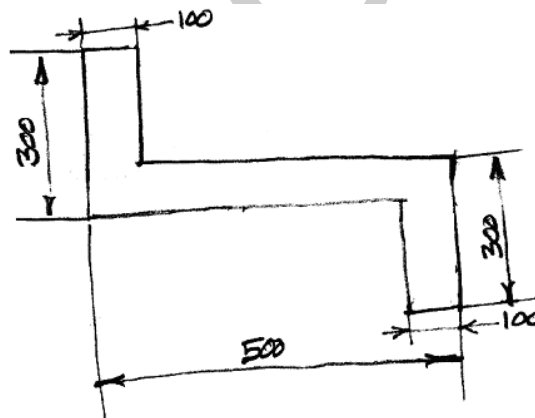


Fig. 13(b)

14. (a) Two stones A and B are projected from the same point at inclinations of 45° and 30° respectively to the horizontal. Find the ratio of the velocities of projection of A and B if the maximum height reached by them is the same.

Or

- (b) A block and pulley system is shown in Fig. 14(b). The coefficient of kinetic friction between the block and the plane is 0.25. The pulley is frictionless. Find the acceleration of the blocks and the tension in the string when the system is just released. Also find the time required for 100 kg block to come down by 2 m.

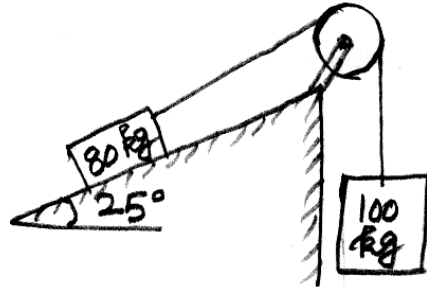


Fig. 14(b)

15. (a) A block of weight 2 kN kept on an inclined plane is acted upon by 0.5 kN horizontal force as shown in Fig. 15(a). The coefficients of friction between the block and the plane are $\mu_s = 0.30$ and $\mu_k = 0.25$. Find whether the block is in equilibrium or not. Also find the magnitude and direction of the friction force.

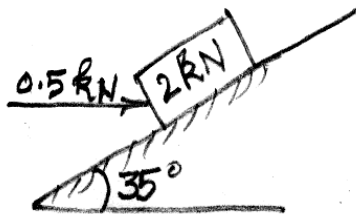


Fig. 15(a)

Or

- (b) A flywheel is fixed to the shaft of a motor. The unit attains the rated speed of 1200 rpm in 4 seconds. But when it is switched off, the unit comes to rest in 70 seconds. Find the revolutions executed by the unit
- To attain the rated speed and
 - To come to rest after being switched off when the acceleration is uniform.