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Total Number of Pages : 04

B.TECH

B.TECH 1ST SEMESTER REGULAR EXAMINATIONS, DECEMBER 2017

BASICS OF MECHANICS

Subject Code:BBSES1031

Time: 3 Hours

Max Marks : 100

The figures in the right hand margin indicate marks.

PART-A**(10X1 = 10 MARKS)****Answer all questions.**

- The force that cancels the effect of the force system acting on the body is known as -----
- A couple consists of two unlike parallel forces of same -----.
- According to the law of moments, if a number of coplanar forces acting on a particle are in equilibrium, then their lines of action are at ----- distances
- Static friction is always _____ dynamic friction.
- The moment of a force is defined as the tendency of a force to produce ----- motion of a body about a fixed point.
- The friction experienced by a body, when in rolling motion, is known as -----
- The coefficient of restitution for perfect elastic bodies is -----.
- Moment of inertia of a triangular section of base (b) and height (h) about an axis passing through its C.G. and parallel to the base, is -----
- The kinetic energy of a body before impact is -----than the kinetic energy of a body after impact.
- The bodies which rebound after impact are called -----

PART-B**(15 x 2 = 30 MARKS)****Answer any fifteen questions from the following.**

- Draw FBD of ball rest against a smooth wall and an inclined plane which making angle α with the vertical wall?
- What is an equilibrant? Discuss with an example?
- What is the effect of force and moment on a body?
- State the theorem of varignon applied to two concurrent coplanar forces?
- State the theorem of transmissibility?
- Define a force and what are the characteristic of force?
- What are the assumptions made in the analysis of the truss
- How method of joint differs from the method of section
- Define angle of repose and prove that it is equal to angle of friction in magnitude
- What is sliding friction and rolling friction?

- 11) Explain the terms moment of inertia and radius of gyration
- 12) Distinguish between centre of gravity and centroid
- 13) What is plane truss and space truss?
- 14) A particle starting from rest from the origin moves in a straight line whose equation of motion is given by $v = 2t^3 - 3t^2$. What will be the displacement of the particle after 4 seconds?
- 15) Define the coefficient of restitution
- 16) What are the units of work done? What is the relation between work done and power?
- 17) Calculate the work done in pulling up a block of mass 200 kg for 10 m on a smooth plane inclined at an angle of 15° with the horizontal.
- 18) A body of mass 7.5 kg is moving with a velocity of 1.2 m/s. If a force of 15 N is applied on the body, determine its velocity after 2 s.
- 19) State and prove Perpendicular axis theorem
- 20) Define D'Alembert's principle

PART-C

(6 x 5 = 30 MARKS)

Section-i

Answer any Six questions

1. Two smooth spheres of weight W and radius r each are in equilibrium in a horizontal channel of A and B vertical sides as shown in Fig. 1. Find the force exerted by each sphere on the other. Calculate these values, if $r = 250$ mm, $b = 900$ mm and $W = 100$ N.

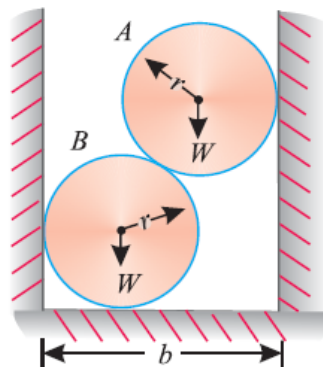


Figure 1

2. A simply supported beam AB of 6 m span is subjected to loading as shown in Fig. 2 Find the support reactions at A and B .

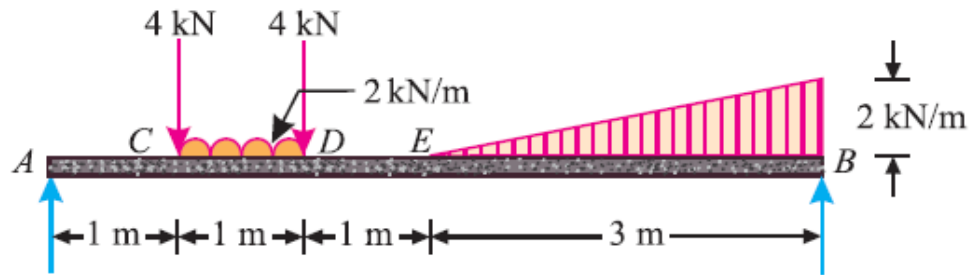


Figure 2

3. State and prove parallelogram law of forces.
4. Determine the coordinates X_c and Y_c of the centroid C of the area between parabola $y=x^2/2$ and the straight line $y=x$ (Fig.3)

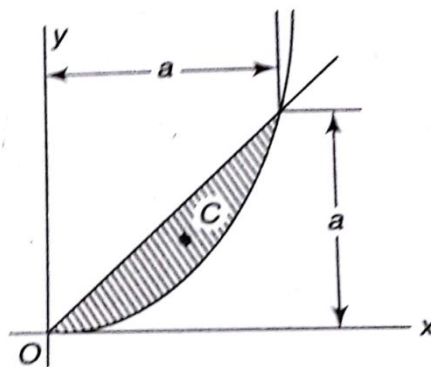


Figure 3

5. State and prove the Theorem of varignon.
6. With respect to coordinate axes x and y , locate the centroid of the shaded area shown in Fig.4

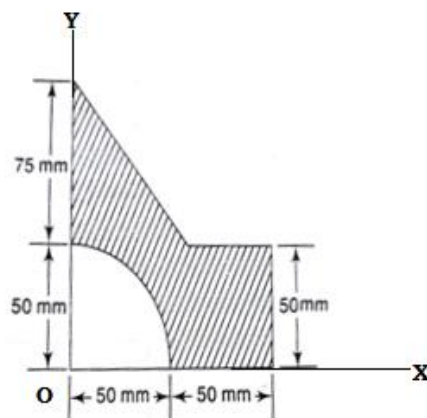


Figure 4

7. The equation of motion of a particle moving in a straight line is given by: $s = 18t + 3t^2 - 2t^3$ where (s) is in metres and (t) in seconds. Find (1) velocity and acceleration at start, (2) time, when the particle reaches its maximum velocity, and (3) maximum velocity of the particle.

8. A ball of mass 1 kg moving with a velocity of 2 m/s impinges directly on a ball of mass 2 kg at the second ball after the impact and the coefficient of restitution rest. The first ball, after impinging, comes to rest. Find the velocity of the second ball after the impact and the coefficient of restitution.

Section-ii

Answer any Two questions

(2 x 15 = 30 MARKS)

1. Two beams AB and DE are arranged and supported as shown in Fig. 5. Find the magnitude of the reaction R_E at E due to the force $P=890$ N applied at B as shown.

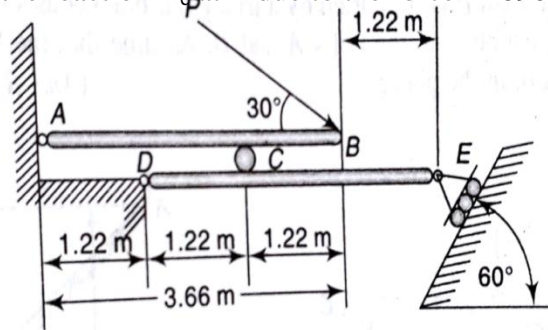


Figure 5

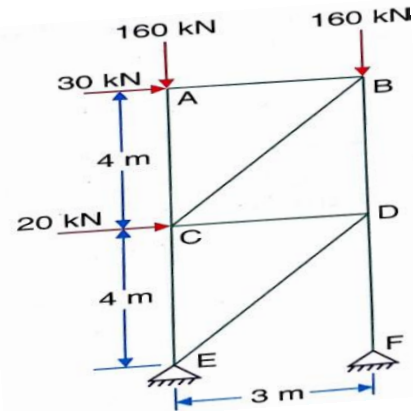


Figure 6

2. Determine the forces in all the members of the truss shown in figure.6
3. With reference to the coordinate axes x and y, locate the centroid of the shaded area of the plane figure shown in fig.7

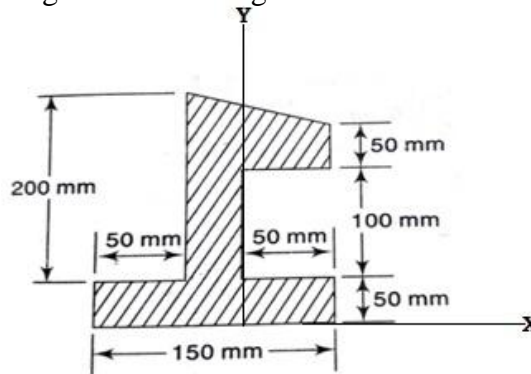


Figure 7

4. If the system in Figure 8, released from rest in the configuration shown, find the velocity v of the block Q after it falls a distance $h=3$ m. Neglect friction and inertia of the pulleys and assume that $P=Q=44.5$ N.

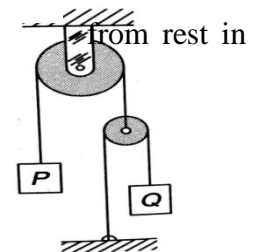


Figure. 8