B.Tech. Second Semester (FPOPC) Polymer (Plastic) (CGS)

11710 : Engineering Mechanics : 2 SCT 3

P. Pages : 4 **AW - 2932**

Time : Three Hours Max. Marks : 80

* 0 9 4 7 *

Notes : 1. Answer **three** question from Section A and **three** question from Section B.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

SECTION - A

1. a) State and explain different system of forces. 4

b) State and explain law of polygon of forces. 3

c) Find the resultant of a given force system as shown in fig. 1. 7

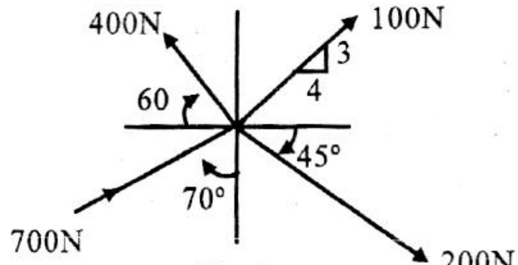


Fig. 1

OR

2. a) Define couple and state its characteristics. 4

b) State and explain Varignon's theorem. 3

c) Determine and locate position of resultant 'R' for the forces acting on L-bent as shown in fig. 2. Take reference point as 'A'. 7

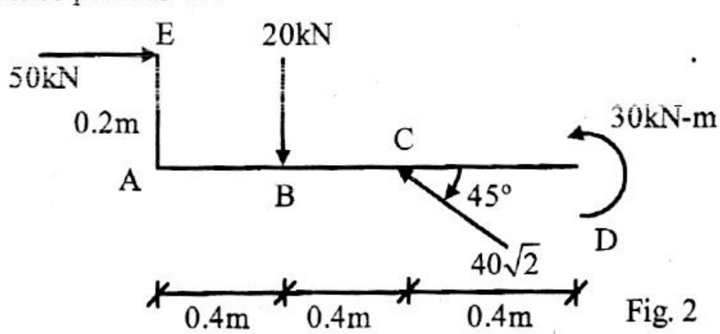


Fig. 2

3. a) State analytical and graphical conditions of equilibrium. 3

b) State and explain Lami's theorem. 3

c) Determine the forces in the cables AB and AC loaded as shown in fig. 3. 7

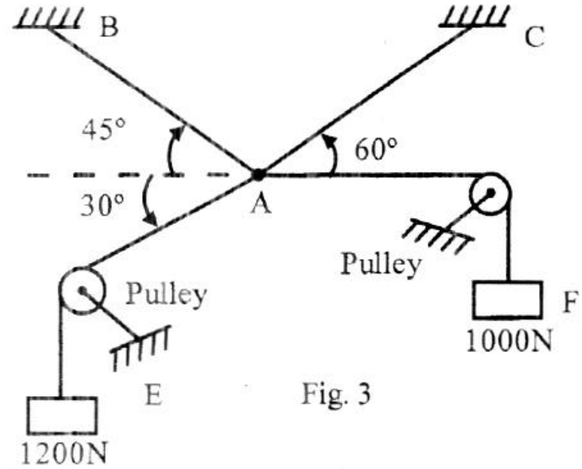


Fig. 3

OR

4. a) State and explain parallel axis theorem. **3**

b) Determine moment of Inertia about centroidal axes for a plane lamina as shown in fig. 4. **10**

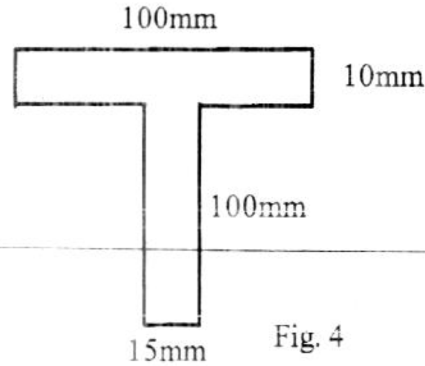


Fig. 4

5. a) State assumption made in analysis of truss. **3**

b) Define perfect and imperfect trusses. **3**

c) Analyse the truss loaded as shown in fig. 5. Tabulate the result. **7**

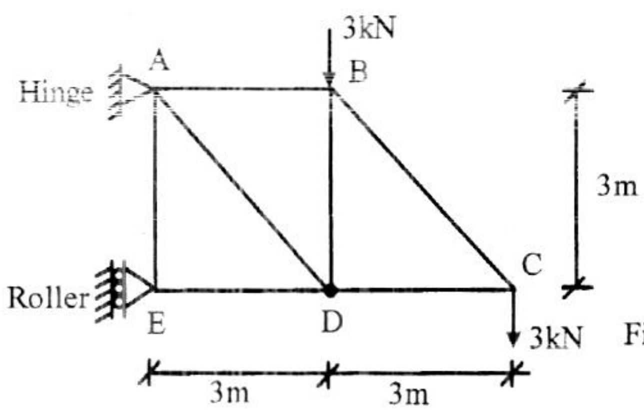


Fig. 5

OR

a) State laws of dry friction. 4

b) Define : 3

i) Angle of repose   ii) Cone of friction

c) A uniform rod AB of length 2.5 m weighing 500 N is hinged at B with end 'A' resting on a 750 N block which in turn rests on a horizontal plane as shown in fig. 6 Take $\mu = 0.3$ for all contact surfaces. Determine minimum value of 'P' required to start rightward motion of the block. 6

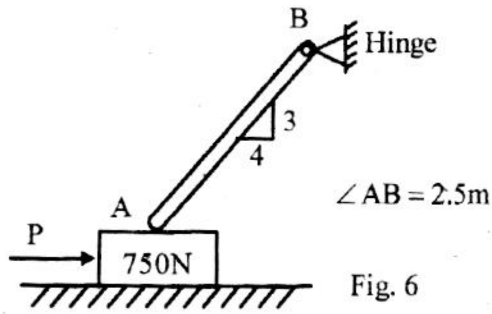


Fig. 6

SECTION - B

7. a) The rectilinear motion of a particle is defined by $a = 6\sqrt{v}$ where a is m/s^2 and v is in m/s. When t = 2 sec, v = 36 m/s and s = 30m. Determine displacement of particle when t = 3 sec. 7

b) A projectile is fired from the edge of a 150 m cliff with an initial velocity of 180 m/s at angle of 30° with the horizontal. 7

Find :

i) The greatest elevation above the ground reached by projectile.

ii) The horizontal distance covered before striking the ground.

OR

8. a) Two trains, one moving at 90 km/hr and other at 120 km/hr, are heading towards one another on a straight level track. When they are 3 km apart, both drivers simultaneously see the other's trains and apply their brakes. If the brakes decelerate each train at the rate of 1 m/s^2 determine whether trains will collide or not ? 7

b) An automobile starting from rest speed upto 40 m/sec with a constant acceleration of 4 m/s^2 runs at this speed for a time and finally comes to rest with deceleration of 5 m/s^2. If the total distance travelled is 1200 m find the total time required. 7

9. a) State and explain D'Alembert's Principle. 3

b) Two blocks A and B are released from rest on a 30° incline when they are 18 m apart. The coefficient of friction under block A is 0.2 and the under the block B is 0.4. In what time block 'A' reaches the block B ? Refer fig. 7. 10

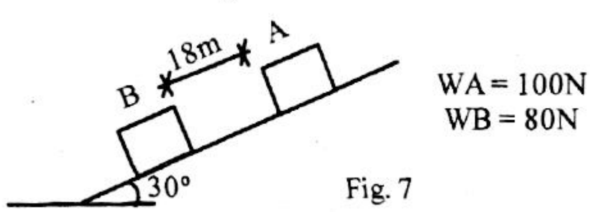
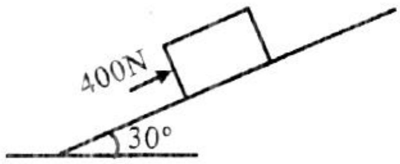


Fig. 7

OR

10. a) Derive work-energy equation. **4**

b) A body weighing 300 N is pushed up an inclined plane 30° with the horizontal. A 400 N force is acting parallel to the plane. If an initial velocity of the body is 1.5 m/s and coefficient of friction is 0.2. Determine what velocity the body will have after moving 6m. Refer fig. 8. **9**



11. a) What is Reversible and irreversible machine ? **4**

b) What load can be lifted by an effort of 120 N, if the velocity ratio is 18 and efficiency of the machine at this load is 60% ? **9**
Determine law of machine, if it is observed that an effort of 200 N is required to lift a load of 2600 N and find the effort required to run the machine at a load of 3.5 kN.

OR

12. a) Define : **6**

i) Mechanical Advantage

ii) Velocity Ratio

iii) Efficiency of a machine

iv) Ideal machine

b) In a differential wheel and axle, the diameter of the effort wheel is 400 mm. The radii of the axle are 150 mm and 100 mm respectively. The diameter of the rope is 10 mm. Find the load which can be lifted by an effort of 25 N assuming the efficiency of the machine to be 84%. **7**

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