

THE KAVERY ENGINEERING COLLEGE
(An Autonomous Institution)

B.E/ B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024

Third Semester

Mechanical Engineering

ME3351 - Engineering Mechanics

(Common to Civil Engineering)

Regulations - 2021

Duration : 3 Hrs

Maximum Marks: 100

PART - A (ANSWER ALL QUESTIONS) (Marks 10*2=20)

Q.No	Questions	BLT	CO	Marks
1.	State the Lami's theorem with its equation.	RE	1	2
2.	When two forces 70 N and 90 N are acting at angle of 45° . Find the resultant and direction.	UN	1	2
3.	State Varignon's theorem.	RE	2	2
4.	Distinguish between couple and moment.	RE	2	2
5.	Locate the centroid for a square of side 20 cm.	RE	3	2
6.	Determine the surface area of cylinder of radius 20 mm and height 60mm using Pappus - Guldinus theorem.	UN	3	2
7.	Differentiate between static friction and dynamic friction.	UN	4	2
8.	In a screw jack, the pitch of the square threaded screw is 5.5 mm and the mean diameter is 70 mm. The force exerted in turning the screw is applied at the end of a lever 210 mm long measured from the axis of screw. Calculate the force required to raise the weight of 30 N.	UN	4	2
9.	A body moves along a straight line so that its displacement from a fixed point from its line is given by $S = 6t^3 - 4t^2 + 20$. Find the displacement, velocity, acceleration at the end of 5S.	UN	5	2
10.	Identify the applications of D'Alembert's principle.	RE	5	2

PART - B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

Q.No	Questions	BLT	CO	Marks
11. a	Five coplanar forces are acting at a point as shown in Fig.1. If the vertical component of all the forces is - 1000N, Find the value of P. Determine the resultant in magnitude and direction.	AP	1	13

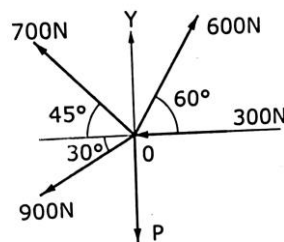


Fig.1.

Or

b	Two rollers each of weight 50N and of radius 10cm rest in horizontal channel of width 36cm as shown in fig.2. Find the reaction on the point of contacts A, B and C.	AP	1	13
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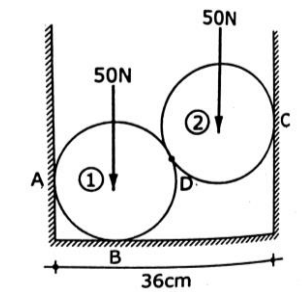


Fig.2.

12. a Find the reactions at the supports A and B of the beam as shown in Fig.3. AP 2 13

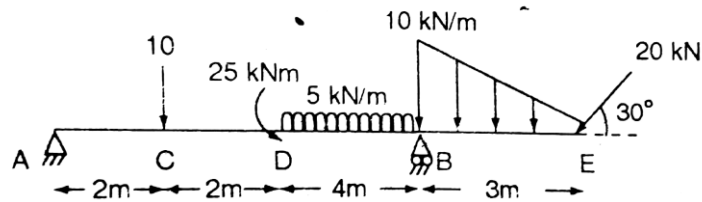


Fig.3.

Or

- b The tensions in cable AB and AC are 100 N and 120 N respectively in Fig. 4. AP 2 13
Determine the magnitude of the resultant force acting at A.

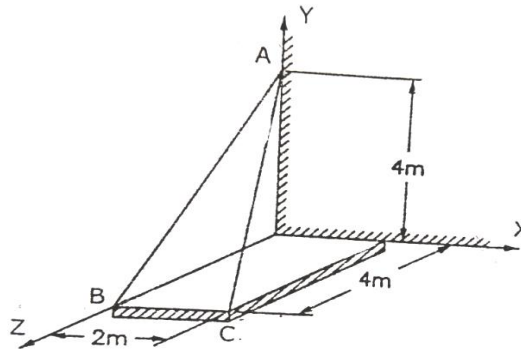


Fig. 4.

13. a Locate the centroid for the given Fig.5. AP 3 13

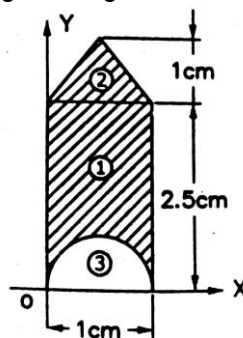


Fig.5.

Or

- b Determine the moment of inertia for the given symmetrical I section in Fig.6. AP 3 13

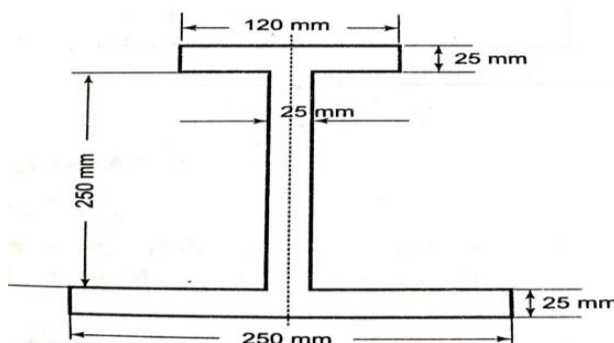


Fig.6.

14. a A uniform ladder of weight 1000 N and of length 4m rests on a horizontal ground and leans against a smooth vertical wall. The ladder makes an angle of 60° with horizontal. When a man of weight 750 N stands on the ladder at a distance 3m from the top of the ladder, the ladder is at the point of sliding as shown in Fig.7. Determine the co-efficient of friction between the ladder and the floor.

AN 4 13

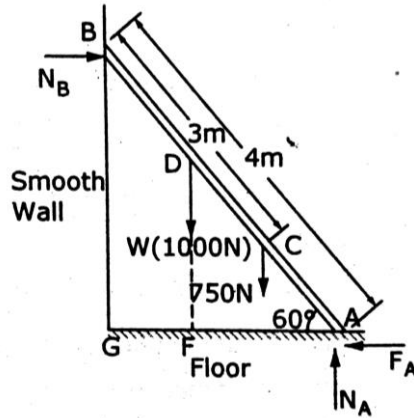


Fig.7.

Or

- b In the arrangement shown in figure, block 2 rests on block 1 and is attached by a rope AB to the wall as shown in Fig.8. Determine the force P is necessary to cause motion of block 1 to impend. The co-efficient of friction between the blocks is 0.25 and between the floor and block 1 is 0.33. Masses of blocks 1 and 2 are 14 kg and 9 kg respectively.

AN 4 13

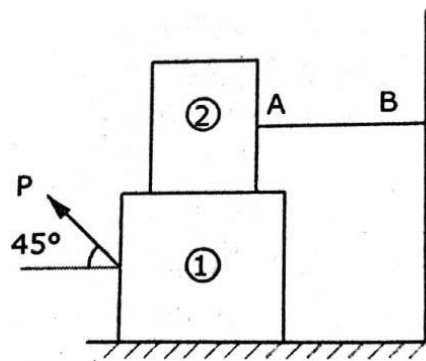


Fig.8.

15. a A train is travelling from A to D along the track shown in Fig.9. Its initial velocity at A is zero. The train takes 5 min to cover the distance AB, 2250 m length and 2.5 minutes to cover, the distance BC, 3000 m in length, on reaching the station C, the brakes are applied and the train stops 2250 m beyond, at D (i) Find the retardation on CD, (ii) the time it takes the train to get from A to D, and (iii) its average speed for the whole distance.

AP 5 13

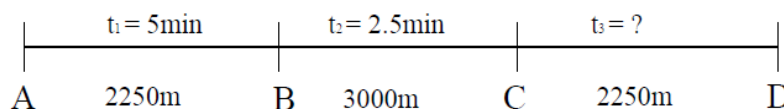


Fig.9.

Or

- | | | | | |
|-----|--|----|---|---|
| b i | A projectile is aimed at a mark on the horizontal plane through the point of projection and falls 12m short when the angle of projection is 15° . When it is tried again it over shoots the mark by 24m when the angle of projection is 45° . Find the correct angle of projection to hit the mark. Velocity of projection is constant in all the cases. | AP | 5 | 7 |
| ii | A body falling freely under the action of gravity passes two points 10m apart, vertically in 0.2 seconds. From what height above the higher point did it start to fall? Take $g = 9.8 \text{ m/s}^2$. | AP | 5 | 6 |

*PART – C (Marks 1*15 = 15)*

Q.No	Questions	BLT	CO	Marks
16. a	Determine the distance S to which the 90 kg painter can climb without causing the 4 m ladder to slip at its lower end A as shown in fig.10. The top of ladder has a small roller, and at the ground the coefficient of static friction is 0.25. The mass center of the painter is directly above her feet.	AN	4	15

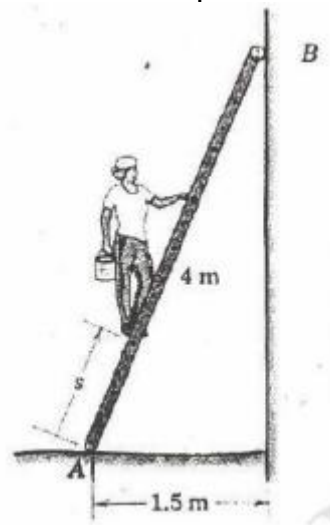


Fig.10

Or

- | | | | | |
|---|---|----|---|----|
| b | Determine the smallest force P required to lift the 13.34 kN load shown in fig.11. The coefficient of static friction between A and C and B and D is 0.3 and that between A and B is 0.4. | AN | 4 | 15 |
|---|---|----|---|----|

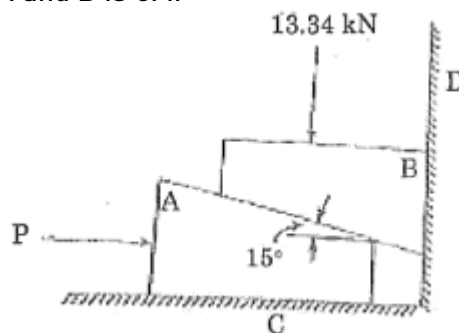


Fig. 11