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Question Paper Code: 93103

B.E. / B.Tech DEGREE EXAMINATION, MAY 2022

Third Semester

Civil Engineering

19UCE303 Basics of Engineering Mechanics

(Regulation 2019)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

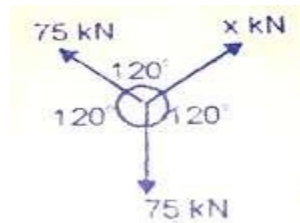
PART A - (10 x 1 = 10 Marks)

1. The velocity ratio in case of an inclined plane inclined at angle ' θ ' to the horizontal and weight being pulled up the inclined plane by vertical effort is CO1- U
(a) $\sin\theta$ (b) $\cos\theta$ (c) $\tan\theta$ (d) $\operatorname{cosec}\theta$
2. The process of finding out the resultant force is known as CO1- U
(a) Superposition of forces (b) addition of forces
(c) Resolution of forces (d) Composition of forces
3. The _____ forces do not cause the rotation. CO1- U
(a) Non-concurrent (b) Concurrent (c) Parallel (d) Non-Parallel
4. Four forces 18 N, 36 N, 54 N and 72 N are acting along sides AB, BC, CD and DA of a rectangle ABCD of side (2*3) m. Their resultant forces is 150 N. Calculate position of resultant w.r.t. 'A' CO4- A
(a) 1.56 m (b) 15.60 m (c) 156 m (d) 0.156 m
5. What is the Centroidal distance of an equilateral triangle of side 2 m? CO3- A
(a) 0.866m (b) 0.769m (c) 1.000m (d) 0.577m
6. Moment of inertia of a squares of side b about an axis through its centre of gravity, is CO3- U
(a) $b^3/4$ (b) $b^4/12$ (c) $b^4/3$ (d) $b^4/8$

7. The total momentum of a system, if no external impressed force acts on it. CO1- U
- (a) increases (b) decreases (c) remains constant (d) none of the above
8. A cubical block rests on an inclined plane of $\mu = 1/\sqrt{3}$, determine the angle of inclination when the block just slides down the inclined plane? CO1- U
- (a) 40° (b) 50° (c) 30° (d) 20°
9. Up to which point on the stress-strain curve is Hooke's law valid? CO1- U
- (a) Elastic limit (b) Yield point
(c) Proportionality limit (d) Fracture point
10. A steel bar 100 mm long is subjected to a tensile stress. If the change in length of the bar is 1/20 mm, what will be the value of E for steel = 2×10^5 N/mm² CO2- A
- (a) 25 N/mm² (b) 50 N/mm² (c) 75 N/mm² (d) 100 N/mm²

PART – B (5 x 2 = 10 Marks)

11. Find the value of X. CO2- A



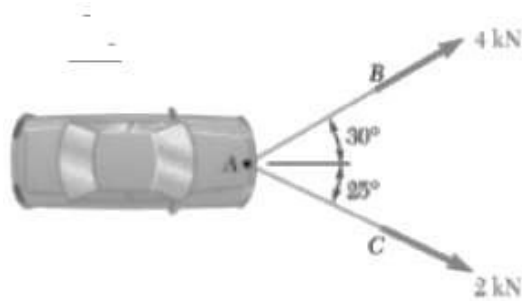
12. Sketch the different types of supports with support reactions CO1- U
13. Differentiate Centroid and Center of Gravity. CO1- U
14. A stone is dropped from the top of a tower. The stone reaches the ground in 100 seconds. Determine the height of the tower. CO2- A
15. Explain clearly the different types of stress and strain. CO1- U

PART – C (5 x 16 = 80 Marks)

16. (a) The resultant of two forces when they are act at an angle of 60° is 14N. If the same forces are acting at the right angles. Their resultant is $\sqrt{136}$. Compare the magnitude of two forces. CO4- Ana (16)

Or

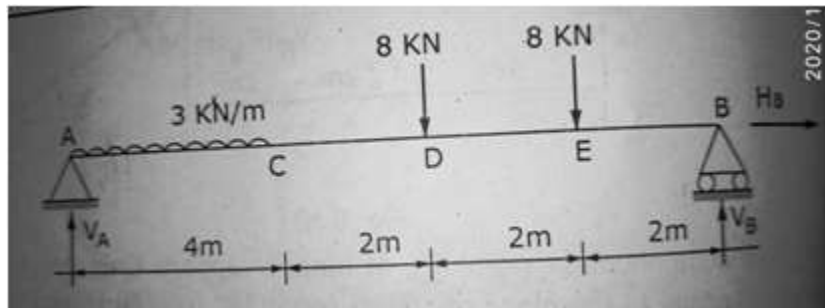
- (b) A disabled automobile is pulled by means of two ropes shown in fig. Analyse the Magnitude and direction of resultant by (a) parallelogram law (b) Triangle law



17. (a) A ladder having a length of 5m is resting against a wall making an angle of 60o to it having co-efficient of friction as 0.3 .Calculate the horizontal force required to be applied at bottom end to avoid slipping of ladder.Weight of ladder is 300N and floor is smooth

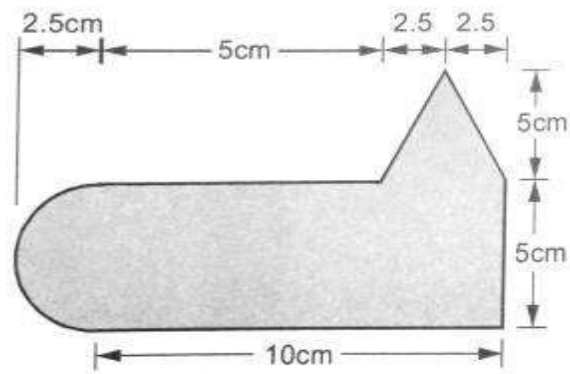
Or

- (b) A beam AB of span 10m is loaded as shown in fig .Determine the reactions at A and B.



18. (a) Locate the centroid of the lamina as shown below:

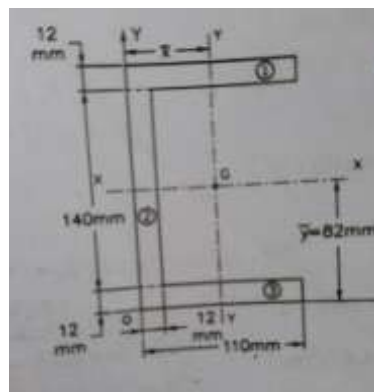
CO3- App (16)



Or

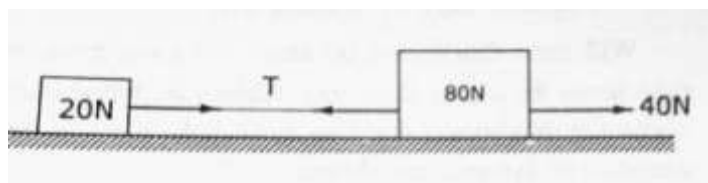
(b) Find the moment of inertia of a channel section as shown in fig,

CO3- App (16)



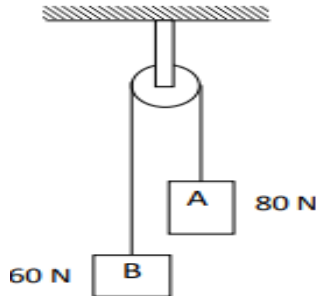
19. (a) Two weights 80 N and 20 N are connected by a thread and move along a rough horizontal plane under the action of a force 40 N, applied to the first weight of 80 N as shown in fig. The coefficient of friction between the sliding surfaces of the weights and the plane is 0.3. Determine the acceleration of the weights and the tension in the thread using D'Alembert's principle.

CO2- App (16)

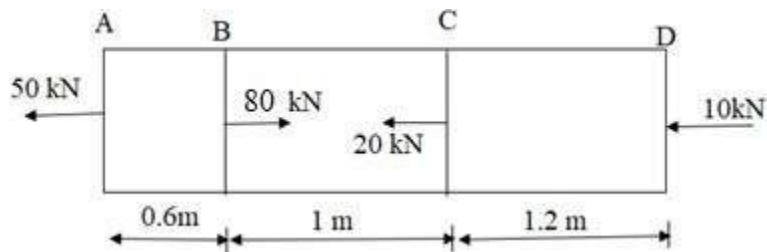


Or

- (b) Two blocks of A and B of weight 80 N and 60 N are connected by a string passing through a smooth pulley as shown in fig. 1. Calculate the acceleration of body and the tension in the string. CO2- App (16)



20. (a) A brass bar having a cross sectional area of 1000 mm^2 is subjected to axial force as shown in the figure. The total change in length of the bar is. Take $E = 1.05 \times 10^5 \text{ N/mm}^2$ CO2- App (16)



Or

- (b) A closely coiled helical spring made of 10mm diameter steel wire has 15 coils 100mm mean diameter. The spring is subjected to an axial load of 100N. Calculate CO2- App (16)
- (i) The maximum shear stress induced
 - (ii) The deflection and
 - (iii) Stiffness of the spring
- Take modulus of rigidity $c = 8.16 \times 10^4 \text{ N/mm}^2$