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Question Paper Code: 53103

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Third Semester

Agricultural Engineering

15UAG303 - FUNDAMENTALS OF ENGINEERING MECHANICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

- Forces are concurrent when their lines of action meet at
 - One point
 - Two points
 - One plane
 - Different planes
- If a number of forces act simultaneously on a particle, it is possible to replace them by a
 - Single force through C.G
 - Single force
 - Couple
 - Couple and a force
- Which of the following do not have identical dimensions?
 - Work and energy
 - Torque and work
 - Torque and energy
 - Moment of a force and angular momentum
- If a rigid body is in equilibrium under the action of three forces, then
 - Lines of action of these forces meet in a point
 - Lines of action of these forces are parallel
 - Both a and b
 - These forces are equal
- Centre of gravity of a solid cone lies on the axis at the height
 - One-fourth of the total height of above base
 - One-third of the total height of above base
 - One-half of the total height of above base
 - One-eighth of the total height of above base

6. The unit of mass moment of inertia is
 (a) kg-m^2 (b) kg/m^2 (c) kg-m (d) kg/m
7. The tension in a cable supporting a lift
 (a) Remains constant whether it moves upwards or downwards
 (b) Is less when the lift is moving downwards
 (c) Is more when the lift is moving upwards
 (d) Is less when the lift is moving upwards
8. A projectile is thrown at an angle to the horizontal with a velocity v . It will have the maximum centripetal acceleration
 (a) At the start (b) At the top of the trajectory
 (c) As it strikes the ground (d) Elsewhere
9. The co-efficient friction depends on
 (a) Area of contact (b) Shape of surfaces
 (c) Strength of the surfaces (d) Nature of surface
10. The slope on the road surface generally provided on the curves is known as
 (a) Angle of friction (b) Angle of repose
 (c) Angle of banking (d) Angle of slope

PART - B (5 x 2 = 10 Marks)

11. State triangular law of forces and Lami's theorem.
12. What do you mean by action and reaction? Give examples.
13. Define centre of gravity and centroid.
14. What do you mean by instantaneous centre of rotation?
15. What is a wedge?

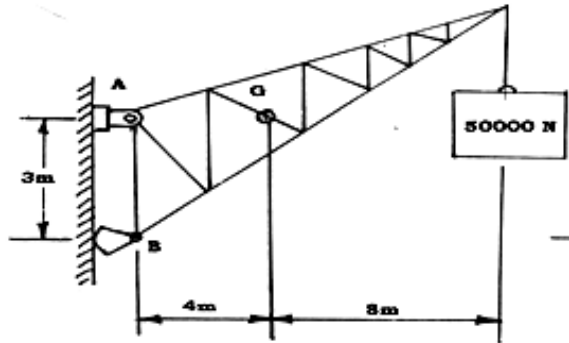
PART - C (5 x 16 = 80 Marks)

16. (a) Two forces of magnitude 20 N and 40 N are acting on a particle such that the angle between the two forces is 135° . If both these forces are acting away from the particle. Calculate their resultant and find its direction. (16)

Or

- (b) Three forces of magnitude 40 kN, 15 kN and 20 kN are acting at a point at O. The angles made by 40 kN, 15 kN and 20 kN forces with X-axis are 60° , 120° and 240° respectively. Determine the magnitude and direction of the resultant force. (16)

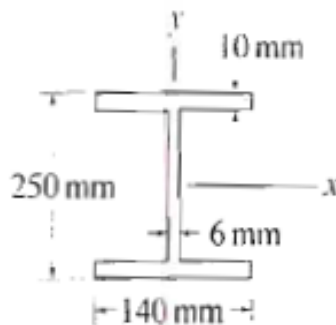
17. (a) A fixed crane weighs 20,000N and is used to lift a load of 50,000N. It is held in place by a smooth pin at A and a rocker at B. The centre of gravity is located at G. Determine the reaction at A & B. (16)



Or

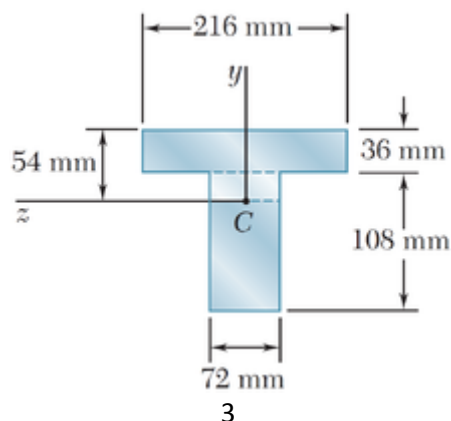
- (b) Three like parallel forces 20 kN, 40 kN and 60 kN are acting at points A, B and C respectively on a straight line ABC. The distances are $AB = 3$ cm and $BC = 4$ cm. Find the resultant and also the distance of the resultant from point A on line ABC. (16)

18. (a) Find the centre of gravity of the I section as shown in figure. (16)



Or

- (b) Determine the moment of the section about the horizontal and vertical axes, passing through the centre of gravity of the T-section as shown in figure. (16)



19. (a) A burglar's car had a start with an acceleration of 2 m/s^2 . A police vigilant came after 10 seconds and continued to chase the burglar's car with a uniform velocity of 40 m/s . Find the time taken, in which the police van will overtake the car. (16)

Or

- (b) Three perfectly elastic balls A, B and C of masses 2 kg , 6 kg and 12 kg are moving in the same direction with velocities 12 m/s , 4 m/s and 2 m/s respectively. If the ball A strikes with the ball B, which in turns, strikes with the ball C, prove that the balls A and B will be brought to rest by the impact. (16)
20. (a) A pull of 20 N , inclined of 25° to the horizontal plane, is required just to move a body placed on a rough horizontal plane. But the push required to move the body is 25 N . If the push is inclined at 25° to the horizontal, find the weight of the body and co-efficient of friction. (16)

Or

- (b) Two bodies of weights 40 N and 15 N are connected to the two ends of a light inextensible string, which passes over a smooth pulley. The weight 40 N is placed on a smooth inclined plane, while the weight 15 N is hanging free in air. If the angle of the plane is 15° , determine: acceleration of the system and tension in the string. Take $g = 9.80 \text{ m/s}^2$. (16)
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