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Reg. No. :

Question Paper Code: 52106

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

Second Semester

Civil Engineering

15UCE206-BASIC ENGINEERING MECHANICS

(Regulation 2015)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions
PART A - (10 x 1 = 10 Marks)

1. What does Newton's third law states?   CO1-R

   (a) The rate of change of momentum is equal to the force applied

   (b) For every reaction, there is an opposite reaction

   (c) The body tends to be rotated if the force is applied tangentially

   (d) The body is rest until a force is applied

2. What is not the condition for the equilibrium in three dimensional system   CO1-R
   of axis?

   (a) $\sum Fx=0$ (b) $\sum Fy=0$ (c) $\sum Fz=0$ (d) $\sum F \neq 0$

3. There are two types of loading. The uniformly distributed and the non-   CO2-R
   uniformly distributed that is the one having two different values at corners.

   (a) The first part of the statement is false and other part is true

   (b) The first part of the statement is false and other part is false too

   (c) The first part of the statement is true and other part is false

   (d) The first part of the statement is true and other part is true too

4. To design the trusses which of the following rules is followed?   CO2-R

   (a) All the loads are applied by the use of cables

   (b) The loads are applied at the joints

   (c) All the loads are not applied at the joints

   (d) The loads are not applied at all to the joints

5. The friction experienced by a body, when in motion, is known as   CO3-R

   (a) rolling friction   (b) dynamic friction   (c) limiting friction   (d) static friction

6. At what conditions the dry friction occurs between the surfaces in contact?   CO3-R

   (a) When there is no lubricating fluid   (c) When there is no adhesive fluid

   (b) When there is no friction fluid   (d) When there is no cohesive fluid

7. The centre of gravity is the ratio of _____ to _____   CO4-R

   (a) The product of centroid and weight to the total weight

   (b) The addition of centroid and weight to the total weight

   (c) The subtraction of centroid and weight to the total weight

   (d) The product of centroid and weight to the total mass

8. The point, through which the whole weight of the body acts, irrespective of   CO4-R
   its position, is known as

   (a) moment of inertia   (b) centre of gravity

   (c) centre of percussion   (d) centre of mass

9. The distance in the parallel axis theorem for the use in the determination of   CO5-R
   the product of the moment of inertia is multiplied by:

   (a) Area   (b) Volume   (c) Linear distance   (d) Area/Volume

10. What is the formula of theorem of perpendicular axis ?   CO5-R

    (a) $I_{zz} = I_{xx} - I_{yy}$ (b) $I_{zz} = I_{xx} + Ah^2$ (c) $I_{zz} - I_{xx} = I_{yy}$ (d) None of the mentioned

PART – B (5 x 2= 10Marks)

11. Two concurrent forces of 12N and 18N are acting at angle of 60^0. Find the   CO1-R
    resultant force.

12. State the different types of supports.   CO2-R

13. Classify the types of friction.   CO3-R

14. What is mean by axis of symmetry?   CO4-R

15. State parallel axis theorem   CO5-R

PART – C (5 x 16= 80Marks)

16. (a) The following forces act at a point.   CO1-App   (16)
        (i) 20 N inclined at 30^0 towards North of East.
        (ii) 25 N towards North.
        (iii) 30 N towards North West.
   (iv) 35 N inclined at 40^0 towards South West.

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Determine: (1) Draw the FBD (2) Calculate the horizontal components of the forces (3) Calculate the vertical components of the forces (4) Find the resultant forces of the system (5) Direction of the resultant forces.

Or

(b) A force vector of magnitude 100 N, is represented by a line AB of CO1-App (16)
co-ordinate a(1,2,3) and B(5,8,12) determine
(i) The components of the force along x,y and z axes
(ii) Angles with x,y and z axes
(iii)Specify the force vector

17. (a) (i) Define beam. What are the different types of supports? Draw CO2-App (6)
the reaction components of each support.
(ii) A simply supported beam of span 9m and it is subjected to CO2-App (10)
two point loads of 15 kN and 25 kN acting at a distance of 3m
and 8m from left support respectively. Determine : (1) loading
Diagram (2) Calculate Total Load (3) Calculate support
reactions.

Or

(b) A truss of 8 m span is loaded as shown in below figure. Find the CO2-Ana (16)
support reactions.
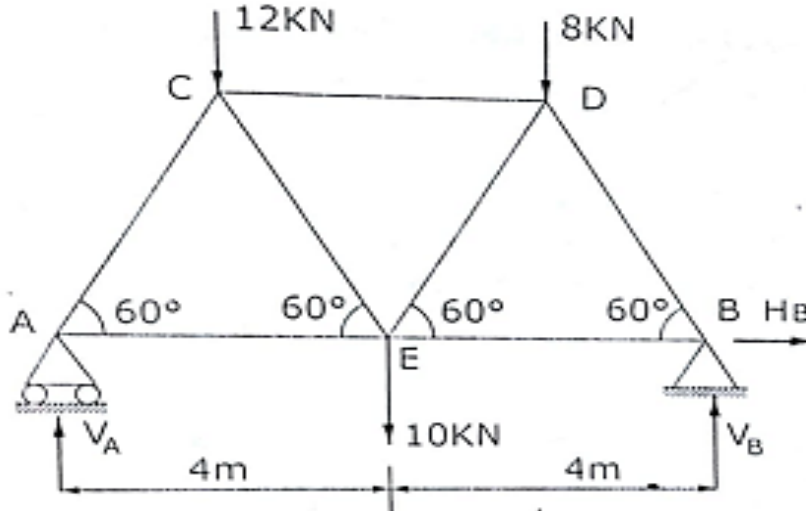
18. (a) A body lying in a horizontal plane is able to start to move when a CO3-Ana (16)
200 N force is applied to the horizontal plane. If this force is
replaced with a force of 150 N acting 30^0 to the horizontal.
Determine the co-efficient of friction and weight of the body.

Or

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(b) (i) A belt is running over a pulley of diameter 800mm and develop a tension of 900 N on the tight side and the angle of lap is 165^0 and coefficient of friction b/w the belt and pulley is 0.15. Find the power transmitted by the pulley when it rotates @ 300RPM. CO3-Ana (8)

(ii) State coulombs' laws of dry friction. CO3-U (8)

19. (a) Locate the centroid of the angle section of size 100x60x20 mm. CO4-Ana (16)

Or

(b) Locate the centroid of the L-section shown in below figure. CO4-Ana (16)
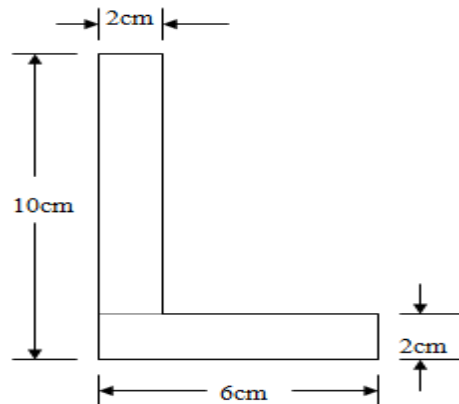
20. (a) Determine the centroid and moment of inertia of an I section with the following details. Size of top and bottom flange= 160x20 mm, Size of web=160x20mm. CO5-U (16)

Or

(b) (i) State moment of inertia theorems CO5-U (8)

(ii) Derive the expression for moment of inertia about major axis of a rectangular lamina of breadth b and depth d. CO5-U (8)

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