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**Question Paper Code: 43705**

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Third Semester

Mechanical Engineering

14UME305 - ENGINEERING MECHANICS

(Regulation 2014)

Duration: 1.15 hrs

Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

**(Answer any six of the following questions)**

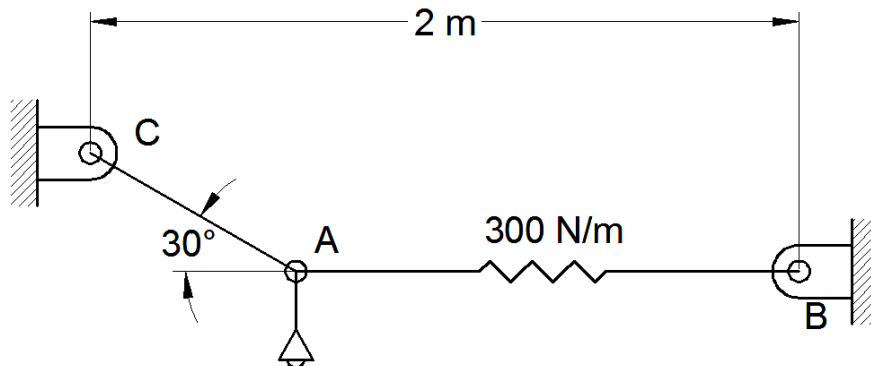
1. If the resultant of two equal forces has the same magnitude as either of the forces, then the angle between the two forces is
  - (a)  $30^\circ$
  - (b)  $60^\circ$
  - (c)  $90^\circ$
  - (d)  $120^\circ$
2. Concurrent forces are those forces whose lines of action
  - (a) lie on the same line
  - (b) meet at one point
  - (c) meet on the same plane
  - (d) none of these
3. The resultant of the two forces  $P$  and  $Q$  is  $R$ . If  $Q$  is doubled, the new resultant is perpendicular to  $P$ . Then
  - (a)  $P = Q$
  - (b)  $Q = R$
  - (c)  $Q = 2R$
  - (d) none of these
4. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to
  - (a) Area of triangle
  - (b) Twice the area of triangle
  - (c) Half the area of triangle
  - (d) None of these
5. The centre of gravity of a quarter-circle lies at a distance of ..... from the base measured along the horizontal radius
  - (a)  $\frac{3\pi}{4r}$
  - (b)  $\frac{4r}{3\pi}$
  - (c)  $\frac{3r}{8}$
  - (d)  $\frac{8}{3r}$

6. Moment of inertia of a circular section about an axis perpendicular to the section is  
 (a)  $\pi d^3/16$                       (b)  $\pi d^3/32$                       (c)  $\pi d^4/32$                       (d)  $\pi d^4/64$
7. The range of a projectile is maximum, when the angle of projection is  
 (a)  $30^\circ$                       (b)  $45^\circ$                       (c)  $60^\circ$                       (d)  $75^\circ$
8. During elastic impact, the relative velocity of the two bodies after impact is \_\_\_\_\_ the relative velocity of the two bodies before impact.  
 (a) equal to    (b) less than  
 (c) equal and opposite to    (d) greater than
9. The maximum frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as  
 (a) static friction    (b) dynamic friction  
 (c) limiting friction    (d) coefficient of friction
10. The bodies which rebound after impact are called  
 (a) inelastic bodies    (b) elastic bodies  
 (c) neither elastic or inelastic bodies    (d) None of these

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

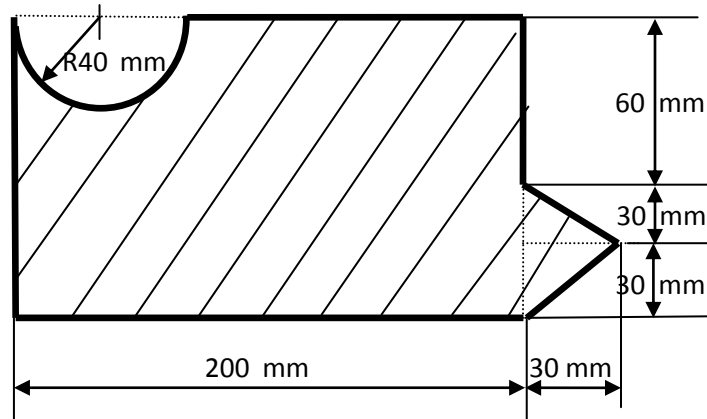
11. Determine the length of the cord AC in figure below so that the 8 kg lamp is suspended in the position shown. The undeformed length of the spring AB is 0.4 m and the spring has a stiffness of 300 N/m. (8)



12. Two beams AB and CD are shown in figure. A and D are hinged supports. B and C are roller supports. (i) Sketch the free body diagram of the beam AB and determine the

reactions at the supports A and B. (ii) Sketch the free body diagram of the beam CD and determine reactions at the supports C and D. (8)

13. Determine the coordinates of the centroid of the plane area shown in below figure. (16)



14. A car starts from rest with a constant acceleration of  $4 \text{ m/s}^2$ . Determine the distance traveled in the 7th second. (8)

15. What should be the value of the angle  $\theta$  so that motion of the 390 N block impends down the plane? The co-efficient of friction  $\mu$  for all surfaces is  $1/3$ . (8)

