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Question Paper Code: 52909A

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Second Semester

Chemical Engineering

15UCH209 - PRINCIPLES OF MECHANICS

(Regulation 2015)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Due to rusting the weight of iron CO1-R
(a) decreases (b) increases (c) remains the same (d) uncertain
2. Steel containing upto 0.15 % carbon, is known as CO1-R
(a) Mild steel. (b) Dead mild steel.
(c) Medium carbon steel. (d) High carbon steel.
3. _____ is a vector whose magnitude is zero. CO2-R
(a) Unit vector (b) Null vector (c) Sliding vector (d) Position vector
4. Which one not a vector quantity CO2-R
(a) Mass. (b) Weight. (c) Force. (d) Velocity.
5. A single force and a couple acting in the same plane upon a rigid body CO3-R
(a) Balance each other (b) Cannot balance each other
(c) Produce moment of a couple (d) Are equivalent
6. Which one not a load CO3-R
(a) Point load. (b) Uniformly distributed load. (c) Moment load. (d) Triangle load.
7. Hook's law holds good up to CO4-R
(a) Yield point. (b) Elastic limit. (c) Plastic limit. (d) Breaking point.

8. The deformation per unit length is called CO4-R
 (a) tensile stress (b) compressive stress (c) shear stress (d) strain
9. Which one not a unit of moment of inertia CO5-R
 (a) mm⁴. (b) cm⁴ (c) m⁴ (d) mm².
10. Moment of inertia of a body does not depend upon CO5-R
 (a) Angular velocity of body (b) Mass of the body
 (c) Axis of rotation of body (d) Depends on all the above

PART – B (5 x 2= 10Marks)

11. What is the effect of chromium in stainless steel? CO1-R
12. Define parallelogram law of forces. CO2-R
13. State Varignon's theorem. CO3-R
14. Draw the stress-strain diagram of mild steel. CO4-R
15. State parallel axis theorem and perpendicular axis theorem. CO5-R

PART – C (5 x 16= 80Marks)

16. (a) A Curved bar is formed of a tube of 20 mm outside diameter and 7.5 mm thickness. The center line of this beam is a circular arc of radius 225 mm. A bending moment of 3 kNm tending to increase curvature of the bar is applied. Calculate the maximum tensile and compressive stresses set up, in the bar. CO1-U (16)
- Or
- (b) What are tool steel? Discuss the composition structure, properties and applications of typical tool steel. CO1-U (16)
17. (a) (i) A force vector of magnitude 100 N is represented by a line AB of co-ordinates A (1,2,3) and B (5,8,12). CO2-U (8)
 Determine
 (a) The components of the force along x, y and z axis.
 (b) Angles with x, y and z axis.
- (ii) A steel rod 2m long and 20mm diameter is subjected to an axial pull of 45KN. Find the change in dimensions of the rod. Assume $E= 2 \times 10^5 \text{ N/mm}^2$ and Poisson's ratio is 0.3. CO2-U (8)

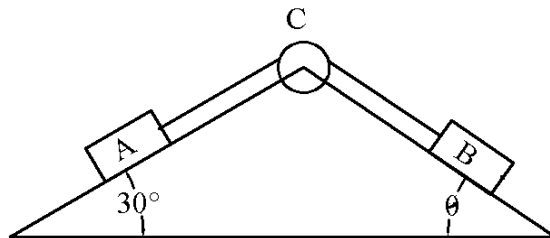
Or

- (b) The lines of action of three forces are concurrent at the origin O passes through points A,B and C having coordinates, (3,0,-3), (2,-2,4) and (-1,2,4) respectively. If the magnitude of the forces are 10N, 30N and 40N, find the magnitude and direction of their resultant. CO2-Ana (16)

18. (a) Recall the types of welded joints with suitable diagrams. CO3- U (16)

Or

- (b) A and B weighing 40N and 30N respectively, rest on smooth planes as shown in fig. they are connected by a weightless cord passing over a friction less pulley. Determine the angle θ and the tension in the cord for equilibrium. CO3- U (16)



19. (a) A bolt is subjected to an axial pull of 10 kN together with a transverse shear force of 5 kN. Solve the diameter of the bolt by using CO4-App (16)

- (i) maximum principal stress theory
- (ii) maximum strain theory
- (iii) Octahedral shear stress theory

Or

- (b) A bar 12 mm diameter gets stretched by 3 mm under a steady load of 8000 N. What stress would be produced in the same bar by a weight of 800 N, Which falls vertically through a distance of 8 cm on to a rigid collar attached at its end? The bar is initially unstressed. Take $E = 2 \times 10^5 \text{ N/mm}^2$. CO4-App (16)

20. (a) Find the moment of inertia of a T section of flange 100 mm x 30 mm and web 20 mm x 80 mm about its centroidal axes. CO5-U (16)

Or

- (b) Enunciate shear and buckling in structural beams. CO5-U (16)

