Register No: ………………………..

B.E. DEGREE EXAMINATIONS: APRIL /MAY 2011

Fourth Semester

CIVIL ENGINEERING

U07CE402: Strength of Materials

Time: Three Hours   Maximum Marks: 100

Answer ALL Questions:-

PART A (10 x 1 = 10 Marks)

1. Impact strength of material is an index of its

   a) Toughness   b) Tensile strength   c) Hardness   d) Ductility

2. Minimum no of equations to be considered for a space truss is

   a) 2   b) 3   c) 6   d) 9

3. The main causes of sinking of support is

   a) Soil settlement   b) end moments   c) loads   d) carry over

4. Maximum deflection for a fixed beam subjected to udl throughout is

   a) $Wl^4/384EI$ b) $5Wl^4/384EI$ c) $Wl^3/48EI$ d) $Wl^4/120EI$

5. Slenderness of a column is zero when

   a) Ends are firmly fixed

   b) Length is equal to radius of gyration

   c) Length is twice the radius of gyration

   d) Column is supported on all sides througout length

6. Euler's crippling load is valid for columns having slenderness ratio

   a) upto 12   b) upto 30   c) 30-80   d) >80

7. Principal plane is one which carries

   a) No shear stress   b) Maximum shear stress   c) No normal stress

8. Maximum principal stress theory is applicable for

   a) Ordinary cast iron   b) mild steel specimen   c) Ductile materials   d) None of the above

9. Winkler Bach theory applies to

   a) Curved bars   b) Fixed beams   c) Struts   d) Propped cantilever

10. Shear centre is also known as

   a) Centroid   b) Kern   c) Centre of twist   d) All the above

PART B (10 x 2 = 20 Marks)

11. State the principle of virtual work.

12. State Maxwell's reciprocal theorem.

13. Define and draw the propped cantilever.

14. State Clapeyron's theorem.

15. Define core of section.

16. State the assumptions made in Lame's theory and write Lame's equation.

17. What is meant by principal plane?

18. Name few theories of failure

19. What is meant by shear centre?

20. Define fracture and creep.

PART C (5 x 14 = 70 Marks)

21. a) A beam of length l simply supported at the ends is loaded with a point load of W at a distance from a from one end. Assuming that the beam has constant cross section with moment of inertia as I and Young's modulus as E. Find the strain energy of the beam and hence find the deflection under the load. Strain energy due to shearing may be neglected.

(OR)

b) A cantilever of rectangular section breadth b, depth d and of length carries udl spread from free end to the mid section of the cantilever. Using castigliano's theorem find the deflection due to shear at the free end.

22. a) A fixed beam of span 6m carries point loads of 160KN and 120KN at distances 2m and 4m from the left end. Find the fixed end moments and reactions at the supports. Draw B.M and S.F diagrams.

(OR)

b) A continuous beam ABC consists of two spans AB and BC of lengths 6m and 8m.The span AB carries a point load of 120KN at 4m from A, while the span BC carries a point load of 160KN at 5m from C.Find the moments and reactions at supports.

23. a) Compare the crippling loads given by Rankine's and Euler's formulae for tublar strut 2.5m long having outer and inner diameters of 38.5mm and 33.5mm loaded through pin joint at both ends. Take yield stress as $315MN/m^2$ a= 1/7500 and E= 210 GN/ m^2. If elastic limit for the material is taken as 200 MN/m^2. Then ahat length of the strut does the Euler formula cease to apply?

(OR)

b) A cast iron cylinder has outer and inner dia of 250mm and 160mm respectively. If the ultimate strength of cast iron is 150 MN/m2 and poisson's ratio is 0.25. Find the internal pressure, according to each of the following theories, which would cause rupture.

(i) Maximum principal stress theory

(ii) Maximum strain theory

(iii) Maximum strain energy theory

Assume no longitudinal stress in the cylinder

24. a) (i) What is stress tensor.

(ii) Write about principal stresses, principal strains and principal planes in three dimension

(OR)

b) Derive the equation for shear strain energy

25. a) Derive the shear centre for channel section having t_1 as the thickness of flange and t_2 as thickness of web.

(OR)

b) (i) Write the assumptions made in Winkler- Bach theory.

(ii) Explain the basic concepts of fatigue, fracture and creep.

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