KATIHAR ENGINEERING COLLEGE, KATIHAR

CIVIL ENGINEERING, 3rd Year (Semester-V)

Subject: Mechanics of Solid-II **Max. Marks: 05**

Time Allotted: 40 Minutes **Instructor: Rashid Mustafa**

Test-I

1. If the Euler load for a steel column is 1000 kN and crushing load is 1500 kN, the Rankine load is equal to

(a) 2500 kN (b) 1500 kN (c) 1000 kN (d) 600 kN

2. Two steel columns X (length L and yield strength = 250 MPa) and Y (length 2L and yield strength 550 MPa) have the same cross sections and end conditions. The ratio of buckling load of column X to that of column Y is ----------

3. A steel column pinned at both ends, has a buckling load of 400 kN. If the column is restrained against lateral movement at its mid height, its buckling load will be ---------- kN

4. For an elastic element, elements of strain tensor is given below. If modulus of rigidity is equal to 100 GPa then shear stress (in MPa) in X-Y plane is

$C_{11} = 0.05$ $C_{12} = 0.004$

$C_{21} = 0.004$ $C_{22} = 0.09$

(a) 400 (b) 500 (c) 800 (d) 1000

5. In a plane strain situation in X-Y plane, the displacement at a point due to loading are given as

$u = (-2x + 8y) \cdot 10^{-6}$ unit

$v = (-3x + 5y) \cdot 10^{-6}$ unit

in X-Y direction respectively. What will be shear strain in X-Y plane?

(a) 5×10^{-6} (b) 7×10^{-6} (c) 8×10^{-6} d) -3×10^{-6}

6. The value of A and B so that the following stress distribution represents an equilibrium state:

$\sigma_{xx} = 24\, x^2 y, \quad \sigma_{yy} = A\, y^3, \quad \tau_{xy} = -B\, xy^2$

Take the body forces are zero.

(a) 24, 8 (b) 8, 24 (c) 12, 4 (d) 4,12

7. The Cartesian components of stress at a point are given below:

$\sigma_{xx} = 10$, $\sigma_{yy} = 5$, $\sigma_{zz} = 4$, $\tau_{xy} = 2$, $\tau_{yz} = -4$, $\tau_{xz} = -6$ MPa

The value of normal and shear stress respectively (in Mpa) on a plane whose direction cosines are 1/3, -2/3, 2/3 are

(a) 10.1, 8.2 (b) 5.1, 4.17 (c) 6.1, 8.17 (d) Insufficient data

8. The state of stress at a point is given by $\sigma_{xx} = 20$, $\sigma_{yy} = 40$, $_{zz} = 60$, $\tau_{xy} = -20$, $\tau_{yz} = -40$, $\tau_{xz} = 50$ MPa.

The value of resultant stress (in MPa) on a plane whose normal is inclined at 40^0 to X axis and 54^0 to Y axis is

(a) 40.20 (b) 34.67 (c) 46.67 (d) 38.67

9. The number of independent stress components in a three dimensional stress system are:

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

10. The component of stress (in MPa) tensor matrix is given below:

$C_{11} = 60$ $C_{12} = 30$ $C_{13} = 20$

$C_{21} = 30$ $C_{22} = 40$ $C_{23} = 10$

$C_{31} = 20$ $C_{32} = 10$ $C_{33} = 100$

The sum of all three stress invariant ($I_1 + I_2 + I_3$) will be ----------

<END OF THE QUESTION PAPER>

NOTE: Solution of class test-I will be uploaded on the college website **www.keck.ac.in**