Code No: **R42019** **R10** **Set No. 1**

IV B.Tech II Semester Regular Examinations, April/May - 2014

ADVANCED STRUCTURAL ANALYSIS

(Civil Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions carry equal marks
*****

1 Derive Equilibrium Equations for a 2 Dimensional State of Stress? [15]

2 What is Plane strain & Plane stress problems? Explain with an example and derive appropriate equations for the above problems? [15]

3 For the stress function $\Phi = -(F/d^3) \times XZ^2(3d-2Z)$, determine the stress components and sketch their variations in a region included in Z = 0, Z = d, X = 0 ,on the side X-positive [15]

4 Derive Equilibrium & Compatibility equations for a body in Polar co-ordinate system? [15]

5 Derive the equation of motion for an damped free vibration of motion for Single degree of Freedom (SDOF) from first principles. Write the equations for maximum displacement amplitude [15]

6 a) A mass of 7 kg is attached to a spring with a stiffness of 4 N/mm. Determine the critical damping coefficient. [8]

b) Derive the expression for the dynamic displacement of an SDOF system for the un damped free vibrations. Sketch the response. [7]

7 A SDOF system is subjected to a harmonic loading defined by $P(t) = P_0 \sin \omega t$. Derive the expression for the dynamic displacement for the under damped vibrations. Sketch the response [15]

8 Discuss about the response of a system under general loading using Duhamel integral [15]

Code No: **R42019** **R10** **Set No. 2**

IV B.Tech II Semester Regular Examinations, April/May - 2014

ADVANCED STRUCTURAL ANALYSIS

(Civil Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions carry equal marks
*****

1 Derive the compatibility equations for a 2 Dimensional state of strain? [15]

2 Derive [**C**] which relates stress & strain, for plane stress & plane strain problems? [15]

3 For the following stress function $\Phi = -(H/\Pi)\ Z \tan^{-1}(X/Z)$
Determine the stress components σ_{xx}, σ_{YY} and τ_{XZ} [15]

4 Derive Compatibility & boundary condition for a body in Polar Co-ordinate system? [15]

5 a) Discuss the differences between the Free vibration and the forced vibration [7]
b) Derive the equations of motion for an undamped free vibration using
i) Simple harmonic motion ii) Newton's second law [8]

6 The successive amplitude from afree vibration test for a structure are 0.69, 0.632, 0.1&0.099 units respectively. Determine the damping ratios of the system, considering each cycle separately and considering them all together [15]

7 A SDOF system is subjected to a harmonic loading defined by $P(t) = P_0 \sin \omega t$.
Derive the expression for the dynamic displacement for the under damped vibrations. Sketch the response. [15]

8 Discuss about the response of a damped system for an impulsive load by using Duhamel integral. [15]

Code No: **R42019** **R10** **Set No. 3**

IV B.Tech II Semester Regular Examinations, April/May - 2014

ADVANCED STRUCTURAL ANALYSIS

(Civil Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions carry equal marks
*****

1 The state of stress is at a point is given by

$\sigma_{xx} = 10$, $\tau_{XY} = -20$

$\sigma_{YY} = 20$, $\tau_{YZ} = 10$

$\sigma_{ZZ} = -10$, $\tau_{ZX} = -30$ [15]

Determine direction cosines of the Principal stresses?

2 Derive Equilibrium Equations for a 3 Dimensional State of Stress [15]

3 For the stress function $\Phi = -(F/d^3)\, x\, X\, Z^2(3d-2Z)$, Determine the stress components and sketch their variations in a region included in Z = 0, Z = d, X = 0 ,on the side X-positive. [15]

4 Derive Equilibrium & Compatibility equations for a body in Polar co-ordinate system? [15]

5 a) Discuss the differences between the Free vibration and the forced vibration [7]

b) Derive the equations of motion for an undamped free vibration using
i) D'Alembert's principle ii) Newton's second law [8]

6 a) A water tank of weight 150 KN is supported by 4 columns built in at ends, each column has $EI=2x10^6$ KN/m^2 .calculate the period of vibration of the tank in its horizontal direction. Neglecting the distributed mass of the columns. [7]

b) Find the frequency of oscillation for the floating pole of the cross section area A having a mass M at one end and the density of the pole is ρ. [8]

7 A SDOF system is subjected to a harmonic loading defined by $P(t) = P_0 \sin \omega t$. Derive the expression for the dynamic displacement for the under damped vibrations. Sketch the response. [15]

8 Discuss about the response of a system under general loading using Duhamel integral. [15]

Code No: **R42019** **R10** **Set No. 4**

IV B.Tech II Semester Regular Examinations, April/May - 2014

ADVANCED STRUCTURAL ANALYSIS

(Civil Engineering)

Time : 3 hours **Max. Marks: 75**

Answer any Five Questions
All Questions carry equal marks
*****

1 The state of stress at a point is given by

$\sigma_{xx} = 10$, $\tau_{XY} = 8$
$\sigma_{YY} = -6$, $\tau_{YZ} = 0$
$\sigma_{ZZ} = 4$, $\tau_{ZX} = 0$

Consider another set of Co-ordinate axis X^1, Y^1, Z^1 in which Z^1 coincides with Z-axis and X^1 is rotated by 30^0 anti clock wise from the X axis. Determine the stress components in the new system? [15]

2 Derive Equilibrium Equations for a 3 Dimensional State of Stress [15]

3 Check whether the system of strains is possible for the following strains?

$\epsilon_{XX} = 5 + X^2 + Y^2 + X^4 + Y^4$
$\epsilon_{YY} = 6 + 3X^2 + 3Y^2 + X^4 + Y^4$
$\nu_{XY} = 10 + 4XY (X^2 + Y^2 + 2)$ [15]

4 Derive Compatibility & boundary condition for a body in Polar Co-ordinate system? [15]

5 a) Discuss the differences between the Free vibration and the forced vibration [7]

b) Derive the equations of motion for an undamped free vibration using
i) D'Alembert's principle ii) Newton's second law [8]

6 a) A mass of 6 kg is attached to a spring with a stiffness of 3.5 N/mm. Determine the critical damping coefficient. [7]

b) Derive the expression for the dynamic displacement of an SDOF system for the undamped free vibrations. Sketch the response. [8]

7 A SDOF system is subjected to a harmonic loading defined by $P(t) = P_0 \sin \omega t$. Derive the expression for the dynamic displacement for the under damped vibrations. Sketch the response [15]

8 Discuss about the response of a damped system for an impulsive load by using Duhamel integral. [15]