

Hall Ticket Number:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Code No.: 22803 M

**VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD**  
**M.E. (Mech. Engg.: CBCS) II-Semester Make Up Examinations, September-2017**  
(Advanced Design & Manufacturing)  
**Computer Aided Mechanical Design and Analysis**

Time: 3 hours

Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

**Part-A (10 × 2 = 20 Marks)**

1. Explain the dilation of pressure vessel under internal pressure.
2. Describe the variation of tangential and radial stress in thick cylinders.
3. Draw the deflections at the inner and outer radii of a hollow circular plate for central point load.
4. Explain the effect of thermal stresses in plates.
5. Sketch the DCB specimen. Write the expression of strain energy release rate for the same.
6. Distinguish between Strain energy release rate and J integral.
7. Find the Eigen values and associated eigenvectors of the matrix [A] given by

$$[A] = \begin{pmatrix} 1 & 2 \\ 2 & 4 \end{pmatrix}$$

8. Write the consistent mass matrix for axial element.
9. How Wilson-  $\Theta$  method is different from central difference method?
10. Why modes are required in mode superposition method?

**Part-B (5 × 10 = 50 Marks)**

11. a) Derive the expressions for stresses in thick pressure vessel subjected to internal pressure and explain its significance. [6]  
b) Show the following components on a neatly drawn sketch of a pressure vessel. [4]  
i) Dished end      ii) Nozzle      iii) Saddle.
12. a) Derive relations connecting the bending moments in orthogonal directions to the deflections and flexural rigidity of the flat plate. [5]  
b) What are the boundary conditions for a      i) Simply supported on all edges      and [5]  
ii) Clamped on all edges of a flat rectangular plate.
13. a) Derive analytically the expression relating Energy Release Rate and Stress Intensity Factor for a plane strain case under Mode-I Loading. [6]  
b) What is fracture toughness? Which factors influence the fracture toughness? [4]
14. a) For a cantilever beam of length L and with rectangular cross section (width b and height h), find the first two natural frequencies if density =  $\rho$ , young's modulus = E, and moment of Inertia = I. [7]  
b) Discuss various types of vibrations and their applications. [3]

15. a) Using the direct integration scheme, obtain the response for the system given by [7]  
$$\begin{pmatrix} 4 & 0 \\ 0 & 4 \end{pmatrix} \{\ddot{q}\} + \begin{pmatrix} 2 & 2 \\ 2 & 5 \end{pmatrix} \{q\} = f(t)$$
 with the initial conditions as follows  
$$q_0 = \begin{Bmatrix} 1 \\ 0 \end{Bmatrix}, \quad \dot{q}_0 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix} \text{ and } f(t) = 0.$$
- b) Write the procedure to find the response of a system by Newmark method. [3]
16. a) Derive the equations for radial and tangential stresses in a cylindrical pressure vessel on which another cylindrical vessel is shrunk on. [5]
- b) Obtain the equilibrium equation for the pure bending of a circular plate of constant thickness. [5]
17. Answer any *two* of the following:
- a) What is  $J$ -integral? Give a graphical interpretation of  $J$ -integral with suitable sketches. [5]
- b) Describe the component mode synthesis. [5]
- c) Describe the Rayleigh damping effect on dynamic response. [5]

\*\*\*\*\*