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Code No.: 8203M

VASAVI COLLEGE OF ENGINEERING (Autonomous), HYDERABAD
M.E. I Year (Mechanical) II-Semester (Make Up) Examinations, Sept./Oct.- 2015
(Advanced Design and Manufacturing)

Computer Aided Mechanical Design and Analysis

Time: 3 hours

Max. Marks: 70

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

Part-A (10 X 2=20 Marks)

1. Show the following components on a neatly drawn sketch of a pressure vessel.
a) Dished end b) Nozzle c) Saddle.
2. Write a note on the various materials used for pressure vessels used under corrosive environment.
3. List the boundary conditions for a rectangular plate clamped on all edges.
4. Examine thermal effects considered in the theory of flat plates.
5. Explain the modes of fracture failure.
6. Explain J-Integral. Describe its features.
7. Evaluate the Eigen values and associated eigenvectors of the matrix [A] given by

$$[A] = \begin{bmatrix} 2 & -1 & -1 \\ -1 & 2 & -1 \\ -1 & -1 & 2 \end{bmatrix}$$

8. Explain sturm sequence.
9. Differentiate between time integration method and mode superposition method.
10. Describe the ill condition for stability of dynamic system.

Part-B (5 X 10=50 Marks)

11. a) Develop the Lamé's expressions for stresses in thick pressure vessel subjected to internal pressure. [5]
b) Develop the equations for radial and tangential stresses in a cylindrical pressure vessel on which another cylindrical vessel is shrunk on. [5]
12. a) Obtain the equilibrium equation for the pure bending of a circular plate of constant thickness. [5]
b) A rectangular plate having dimensions of 500 mm x 400 mm and thickness 10 mm is simply supported at the ends. It is subjected to a uniformly distributed load of 10 MPa. Estimate the deflection of the plate at the middle point, given that $E=2 \times 10^5$ N/Sq.mm and $\nu=0.3$. [5]
13. a) Show step by step procedure for an expression for the stress required to advance the crack under plane stress and plane strain condition. [5]
b) A large plate of 10 mm thickness with an edge crack of 20 mm length is pulled slowly. If the surface energy/ area is 10^6 N/mm. Estimate the stress required to advance the crack under
(i) Plane stress and (ii) plane strain condition. Assume $E = 200$ GPa, $\nu= 0.3$ [5]

14. Give a critical review of the computational efforts involved in
- a) Subspace iteration [5]
 - b) Lanczo's methods. [5]
15. a) Solve the problem $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \{\ddot{q}_t\} + \begin{bmatrix} 2 & 2 \\ 2 & 5 \end{bmatrix} \{q_t\} = \{F(t)\}$ with initial conditions $q_0 = \begin{Bmatrix} 1 \\ 0 \end{Bmatrix}, \dot{q}_0 = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$ and $F(0) = 0$, using Newmark method and choose $\Delta_t = 0.25$. [8]
- b) Draw the response curve for the above behavior. [2]
16. Explain the following:
- a) Bending of a plate in two perpendicular directions [5]
 - b) Energy release rate of DCB Specimen [5]
17. Write short notes on any **two** of the following:
- a) Component mode synthesis [5]
 - b) Limitations of using the central difference method for the direct integration of the dynamics equation involving the matrices [M], [C] and [K] [5]
 - c) The procedure to estimate the natural frequencies of stepped beam [5]
