Hall Ticket Number:

Code No. : 22855

# VASAVI COLLEGE OF ENGINEERING *(AUTONOMOUS)*, HYDERABAD
*Accredited by NAAC with A++ Grade*
## M.E. (Mech. Engg.) II-Semester Main Examinations, September-2022
## Computer Aided Mechanical Design and Analysis
(Advanced Design & Manufacturing)

Time: **3 hours**                                                                     Max. Marks: **60**

*Note: Answer all questions from **Part-A** and any **FIVE** from **Part-B***

*Part-A (10× 2 = 20 Marks)*

| Q. No. | Stem of the question | M | L | CO | PO |
|--------|----------------------|---|---|----|----|
| 1. | List the main parts of a pressure vessel and show them with a sketch. | 2 | 1 | 1 | 1 |
| 2. | What is Autofrettage of thick cylinders? | 2 | 1 | 1 | 1 |
| 3. | List the boundary conditions for a simply supported rectangular plate. | 2 | 1 | 2 | 1 |
| 4. | What is the effect of thermal stresses on plates? | 2 | 1 | 2 | 2 |
| 5. | Define the terms i). Fracture Resistance and ii). Critical stress Intensity Factor | 2 | 1 | 3 | 1 |
| 6. | List the two important features of the J-integral. | 2 | 1 | 3 | 1 |
| 7. | Define i). Orthogonal matrix and ii).Hermitian matrix | 2 | 1 | 4 | 1 |
| 8. | What is the principle involved in Component Mode Synthesis? | 2 | 1 | 4 | 2 |
| 9. | Distinguish between Direct integration and Mode super position methods. | 2 | 2 | 5 | 2 |
| 10. | Define Raleigh's damping. | 2 | 2 | 5 | 1 |

*Part-B (5 × 8 = 40 Marks)*

| | | | | | |
|--------|----------------------|---|---|----|----|
| 11. a) | Describe the variation of tangential and radial stresses in thick cylinders subjected to internal pressure. | 5 | 2 | 1 | 3 |
| b) | Explain the effect of thermal stresses in thick cylinders. | 3 | 2 | 1 | 2 |
| 12. a) | Develop the expressions for maximum deflection and maximum bending stress in a constant thickness plate when it is subjected to uniformly distributed load with clamped edges. | 4 | 4 | 2 | 4 |
| b) | Deduce the differential equation for deflection curve when a flat plate is subjected to bending in two perpendicular directions. | 4 | 3 | 2 | 3 |

| | | | M | L | CO | PO |
|---|---|---|---|---|---|---|
| 13. | a) | Determine the energy release rate of a DCB specimen using change in strain energy approach for constant displacement. | 4 | 3 | 3 | 3 |
| | b) | Prove that J-Integral is path independent. | 4 | 4 | 3 | 4 |
| 14. | a) | Evaluate the Eigenvalues and associated eigenvectors of the matrix [A] given by $$[A]: \begin{pmatrix} 2 & 1 & -1 \\ 1 & 4 & -1 \\ -1 & -1 & 6 \end{pmatrix}$$ | 4 | 3 | 4 | 3 |
| | b) | Explain the Subspace iteration method of modal analysis. | 4 | 2 | 4 | 1 |
| 15. | a) | Solve the problem $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \{\ddot{q}_t\} + \begin{pmatrix} 2 & 2 \\ 2 & 6 \end{pmatrix} \{q_t\} = \{F(t)\}$ with initial conditions $q_0 = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$; $\dot{q}_0 = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$; and $F(t) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$, using Newmark method and choose $\Delta t = 0.25$. | 5 | 4 | 5 | 4 |
| | b) | What are the sequential steps involved in Mode super position method. | 3 | 3 | 5 | 2 |
| 16. | a) | What are the significant factors to be considered in design of a pressure vessel? | 4 | 2 | 1 | 1 |
| | b) | A rectangular plate having dimensions of 600 mm x 500 mm x 12mm is simply supported at the ends. It is subjected to a uniformly distributed load of 2 N/mm². Estimate the deflection of the plate at the middle point, given that E= 2 x 10⁵MPa and γ= 0.3. | 4 | 3 | 2 | 3 |
| 17. | | Answer any *two* of the following: | | | | |
| | a) | Define and sketch the Modes of fracture failure. | 4 | 2 | 3 | 2 |
| | b) | List the properties of eigen values and eigen vectors. | 4 | 2 | 4 | 3 |
| | c) | Discuss the conditions for stability in integration methods. | 4 | 3 | 5 | 2 |

M : Marks;    L: Bloom's Taxonomy Level;    CO; Course Outcome;    PO: Programme Outcome

| i) | Blooms Taxonomy Level – 1 | 20% |
|---|---|---|
| ii) | Blooms Taxonomy Level – 2 | 35% |
| iii) | Blooms Taxonomy Level – 3 & 4 | 45% |

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