Total No. of Questions : 8]

P736

[5870] - 1027 T.E. (Mechanical) COMPUTER AIDED ENGINEERING (2019 Pattern) (Semester - II) (302050)

Time : 2¹/₂ Hours]

Instructions to the candidates:

[Max. Marks : 70

SEAT No. :

- 1) Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.
- 2) Neat diagram must be drawn wherever necessary.
- 3) Figures to the right side indicate full marks.
- 4) Assume the suitable data, if necessary.
- Q1) a) An axial load P = 300 kN is applied on a stepped steel bar as shown Figure 1. $A_1 = 250 \text{ mm}^2$; $A_2 = 400 \text{ mm}^2$; E = 200 GPa. [12]

Formulate:

- i) Element stiffness matrix $[k_1], [k_2], [k_3]$.
- ii) Global stiffness matrix [K].

Determine using elimination approach

i) Nodal displacement vectors $[u_1]$, $[u_2]$, $[u_3]$, $[u_3]$,

300 kN

150 mm

ii) Element Stresses $[\sigma_1]$, $[\sigma_2]$



OR

Q2) a) For the two-bar truss shown in Figure 2 below. All the elements have E = 200 GPa and $A = 600 \text{ mm}^2$. [12]

Area = 400 mm

300 mr

Formulate:

- i) Element stiffness matrix $[k_1]$, $[k_2]$
- ii) Global stiffness matrix [K]

Determine using elimination approach:

i) Nodal displacement vectors at node 2 $[u_3]$.

4 m

ii) Element Stresses in element 1 [σ_1].



= 1000 kN

- Q3) a) Explain what is meant by Plane Stress and Plane Strain condition and how it is used for conversion of 3D problem into 2D problem. [9]
 - b) What is CST element? Explain in details natural coordinate and shape function for CST element. [8]

OR

- *Q4*) a) In Post-processing of Computer Aided Engineering (CAE).
 - i) How to validate and check accuracy of the result in Computer Aided Engineering.

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- ii) How to view and interpret results.
- b) Write down the special tricks for Post Processing \sim [7]
- *Q5*) a) What is Non-linear analysis? Write down the comparison of linear and non-linear finite element analysis. [9]
 - b) Explain Geometric Nonlinearity and Material Nonlinearity related to nonlinear problems. [8]

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- What is Dynamic analysis? Write down the comparison of static and **Q6**) a) dynamic finite element analysis. [9]
 - Explain the following terms in dynamic analysis [8] b)
 - Time domain i)
 - Frequency domain ii)
 - Simple harmonic motion iii)
 - Free vibrations iv)
- Illustrate the applications of Computer Aided Engineering (CAE) in Noise, **Q7**) a) Vibration and Harness with examples. [10]
 - Elaborate the CAE based applications in casting and sheet metal b) simulations. [8]

OR

- Elaborate the durability analysis used in finite element method. Explain in **Q8**) a) detail FEA based fatigue analysis using: **[10]**
 - i) Stress - life approach
 - Strain life approach ii)
 - Illustrate the applications of Computer Aided Engineering in Computational b) Ex exercised and the second s Fluid Dynamics in different sectors. 18.28.25.

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