

23125

**M. Tech. 3rd Semester (M.E)
(Manufacturing and Automation)
Examination-May, 2015**

SIMULATION AND ANALYSIS

Paper : 953

Time : 3 hours

Max. Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any **five** questions.

1. Derive stiffness, equations for a bar element from the one dimensional by weighted residual or potential energy approach. (20)
2. The coordinates of the nodes of triangular elements are 1(-1,4), 2(5,2) and 3(3,6) of thickness 0.2 cm. The convection takes places over all surfaces with a heat transfer coefficient of $150 \text{ W/m}^2\text{K}$ and $T_\infty = 30^\circ\text{C}$. Determine the conductivity matrix and the load vector if the internal heat generation is 200 W/cm^3 . Assume thermal conductivity of the elements is 100 W/mk . (20)

23125-350-(P-4)(Q-8)(15) (1)

[Turn Over

3. Consider axial vibrations of the steel stepped bar as shown in Fig 1:

- (a) Develop global stiffness matrix and mass matrix,
- (b) natural frequencies and
- (c) Mode Shapes. (20)

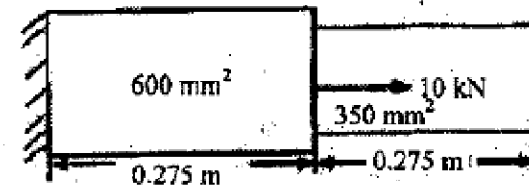


Fig. 1

4. For the beam and loading shown in fig 2. determine : <http://www.HaryanaPapers.com> (20)

- (i) the slopes at 2 and 3 and
- (ii) the vertical deflection at the mid point of the distributed load.

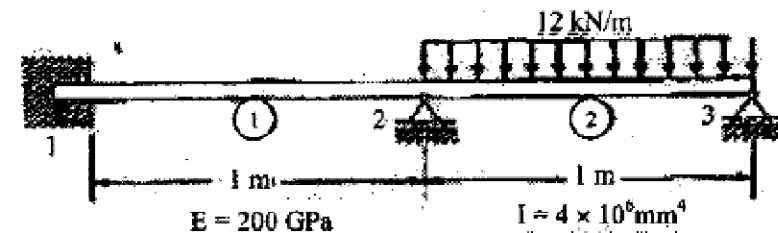


Fig. 2

23125-350-(P-4)(Q-8)(15) (2)

5. Calculate the flow field of incompressible fluids using SIMPLE algorithm writing down the important equations. Draw the staggered grid indicating the physical parameters used in this algorithm. Explain the various computer graphic techniques used in CFD.

(20)

6. Using Vorticity and Stream function method, derive the expression for momentum equation without pressure term. What are its advantages and disadvantages compared with other methods?

(20)

7. (a) What are the important applications of CFD in engineering?

(10)

(b) Discuss the properties of discretization schemes and explain upwind discretization applied to FVM.

(10)

8. (a) Differentiate among finite difference method, finite element method and finite volume methods with suitable examples.

(10)

(b) Explain the importance of upwind scheme for solving the fluid flow problems with suitable examples.

(10)

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