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Total No. of Printed Pages: 1

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B. Tech. (Aeronautical Engineering) (Semester – 5th)

FINITE ELEMENT METHODS

Subject Code: BANED1-512

Paper ID: [18110228]

Time: 03 Hours

Maximum Marks: 40

Instruction for candidates:

1. Section A is compulsory. It carries 10 marks. It consists of 5 questions of 02 marks each.
2. Section B consist of 05 questions of 05 marks each. The student has to attempt any 04 questions out of it.
3. Section C consist of 02 questions of 10 marks each. The student has to attempt any 01 question.

Section – A

(2 marks each)

Q1. Attempt the following:

- a. Define the Finite Element Method and list its advantages.
- b. Explain the role of finite element analysis in computer-aided design.
- c. What are the basic steps involved in the Finite Element Method?
- d. Discuss the convergence criteria in Finite Element Analysis.
- e. Explain the mathematical preliminaries involved in Finite Element Analysis.

Section – B

(5 marks each)

Q2. Discuss the history and engineering analysis of the Finite Element Method.

Q3. Explain the classification of elements in the Finite Element Method.

Q4. Discuss the basic equations and potential energy functional in the analysis of solid mechanics problems.

Q5. The following stresses are developed in a plate under plane stress $\sigma_{xx} = 10 \text{ MPa}$, $\sigma_{yy} = -15 \text{ MPa}$ and $\sigma_{xy} = 5 \text{ MPa}$. Determine strains induced in the plate, assuming that $E = 209 \text{ GPa}$ and $\nu = 0.3$

Q6. Discuss the analysis of bodies of revolution under axi-symmetric loading using the Finite Element Method.

Section – C

(10 marks each)

Q7. Discuss the analysis of plane elasticity problems using the Finite Element Method.

Q8. Explain the applications to solid mechanics problems using the Finite Element Method.