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M.E. DEGREE EXAMINATION, MAY/JUNE 2008.

Elective

Structural Engineering

ST 1623 — CAAD FOR STRUCTURES

(Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the importance and advantages of graphics transformations.
2. Distinguish between polyline and polygon. Give an example for them in civil engineering.
3. Distinguish between pre processor and post processor.
4. In displacement method, _____ are the unknowns and _____ equations are the final equations; in force method, _____ are the unknowns and _____ equations are the final equations.
5. State the significance of bill of materials.
6. Distinguish between computer aided analysis problem and computer aided design problem. Give an example for them in civil engineering.
7. Define slack variable and indicate the importance.
8. Distinguish between event and activity.
9. State the advantages of expert system
10. List any two expert system shells.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Explain the salient features of the following two dimensional transformations. (1) Translation (2) Rotation about origin (3) Scaling and (4) Mirror reflection about an axis. Write the corresponding matrices for computer applications. (10)
- (ii) Explain the principles and application of solid modeling for engineering problems. (6)

Or

- (b) (i) Illustrate the various steps in modeling curves and curved surfaces. Illustrate the application using an example in civil engineering. (10)
- (ii) Explain the salient features of any one drafting software package. (6)
12. (a) (i) Explain various steps in finite element analysis. Give an application to structural engineering problem. State the advantages? (10)
- (ii) Explain the requirements of post processor and mention the characteristics of post processor of any one structural engineering software. (6)

Or

- (b) (i) Draw a neat sketch of a pin jointed plane truss element and mark degrees of freedom. Assume the coordinates of nodes as $1(X_1, Y_1)$ and $2(X_2, Y_2)$. Derive the element stiffness matrix. (8)
- (ii) Explain the assembly procedure and methods of applying boundary conditions in finite element analysis. (8)
13. (a) Explain the step by step procedure for computer aided design of the following :
- (i) Steel column and (8)
- (ii) Doubly reinforced concrete beam. (8)

Or

- (b) Explain the step by step procedure for computer aided design and drawing of the following :
- (i) Two way reinforced concrete slab with various boundary conditions (8)
- (ii) Isolated reinforced concrete square footing. (8)

14. (a) (i) State the characteristics of linear programming problem, illustrate the principles in optimal design of a simple portal frame. (8)
- (ii) State the concepts and applications of genetic algorithms in structural engineering. (8)

Or

- (b) (i) Explain the significance of post optimality analysis. (6)
- (ii) Explain the concepts of CPM and PERT techniques. Illustrate the salient features of computer aided applications of the above techniques for major civil engineering projects. (10)
15. (a) (i) Explain the architecture of expert system and state the salient characteristic of various components. What is the importance of inference engine? (10)
- (ii) Define forward chaining and backward chaining and explain with examples from civil engineering. (6)

Or

- (b) (i) Explain the methods of knowledge representation using rules, semantic net and frames. Illustrate the application of if then rules in soil mechanics and structural engineering problems. (12)
- (ii) Illustrate the salient characteristics of neural network. (4)
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