APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Scheme for Valuation/Answer Key

Scheme of evaluation (marks in brackets) and answers of problems/key

SEVENTH SEMESTER B.TECH DEGREE EXAMINATION (S), MAY 2019

Course Code: CE403

Course Name: STRUCTURL ANALYSIS - III

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks. Marks

1 (a) Two assumptions (2)

(b) Column shear -3 (13)

Column moment - 2

Beam moment - 2

Beam shear -2

Axial force -1

Figure - 3

2 (a) Definition of static indeterminacy – 1 mark (5)

Definition of external indeterminacy – 1 mark

Definition of internal indeterminacy – 1 mark

Two examples – 2 mark

(b) Concept – 4 marks (5)

Example – 1 mark

(a) Definition – 2 mark (5)

Equation – 1 mark

Dk = - 2 mark

3 a) Procedure for analysis by flexibility matrix – 5 marks (10)

Procedure for analysis by stiffness matrix – 5 marks

b) External indeterminacy – 1 mark (5)

Internal indeterminacy of pin jointed frame – 2 marks

Internal indeterminacy of rigid jointed frame – 2 marks

PART B

Answer any two full questions, each carries 15 marks.

4 a) Flexibility matrix and deflection due to applied load matrix can be developed from that of constituent elements by using Flexibility method. Approach in which (8)

matrix for entire structure are obtained from respective matrices for constituent elements is known as element approach. (3)

Forming equation$[P_R^*]=[f][P\}$

$[P_R^*]$ is forces in released structure in element coordinates

[f] is force transformation matrix

[P} is force in system coordinates(

Elements of jth column of force transformation matrix are formed by applying unit force at system coordinate j. Forces at element coordinates may be determined by considering free bodies of elements (5)

b) Determine internal and external redundancy (2) (7)

Identify no of redundant reactions equal to degree of indeterminancy (1)

Make the structure determinate by removing redundant reactions (1)

Apply unit unit load in the directions of redundant load. Find elements of flexibility coefficient matrix (2)

Find forces in members using compatibity condition

$[\delta]\ [P]= [\Delta]-[\Delta L]$ (1)

5 a) Static indeterminacy (1mark) (15)

Equivalent joint loads (2mark)

Equilibrium matrix equation (2mark)

Element flexibility matrix (2mark)

BMD (4 marks)

SFD (4marks)

6 a) Definition (2 mark) For each give one mark each (1 x 3= 3 marks) (5)

b) Formulation of displacement transformation matrix (5 marks) (10)

Finding K (3 marks)

Final forces (2 marks)

PART C

Answer any two full questions, each carries 20 marks.

7 a) Divide the structure into elements, mark DOF, Element stiffness matrix K_e, Global Stiffness Matrix K_G, Equivalent joint load matrix P, Solve for Δ, Member forces (5)

b) Derivation of global stiffness matrix K_G from $K_{elements}$ - 4 (15)

Modification of K_G by applying BCs - 2

Equivalent joint loads - 6

Calculation of Δ using $P=K_G.\Delta$ - 2

Member forces - 1

8 a) Explanations-displacement method, founded on stiffness method, using kinematic redundancy, global stiffness matrix from element stiffness, transformation from local axes to global axis (5)

b) Derivation of global stiffness matrix K_G from $K_{elements}$ - 4 (15)

Modification of K_G by applying BCs - 1

Equivalent joint loads - 6

Calculation of Δ using $P=K_G.\Delta$ - 2

Member forces - 2

9 a) $m\ddot{x} + c\dot{x} + kx = 0.$ (5)

$m\ddot{x} + c\dot{x} + kx = F_0 \sin(2\pi ft).$ for damped (2.5 marks)

Write for undamped also (2.5 marks)

Total 5 marks

b) Start from free body diagram 1 marks (15)

Derivation of the equation $m\ddot{x} + c\dot{x} + kx = 0.$ 10 marks

Response diagram 4 marks

Total 15 marks

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