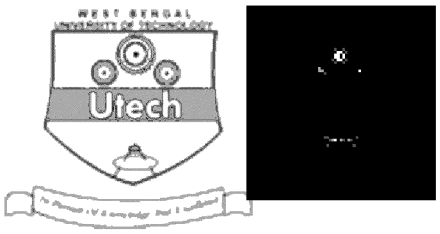
CS/B.TECH (CE)/SEM-6/CE-604/09



1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/B.TECH (CE)/SEM-6/CE-604/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

STRUCTURAL ANALYSIS – III (SEMESTER - 6)

Time : 3 Hours] [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question.**
   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

	Group – A										Group – B			Group – C				
Question Number																	***Total Marks***	***Examiner's Signature***
Marks Obtained																		

.....
Head-Examiner/Co-Ordinator/Scrutineer

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ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

STRUCTURAL ANALYSIS – III

SEMESTER – 6

Time : 3 Hours] [Full Marks : 70

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the the following : $10 \times 1 = 10$

i) The portal method is related to ..... load analysis.

a) vertical b) horizontal

c) both (a) & (b) d) none of these.

ii) The number of unknowns to be determined in the stiffness method is equal to

a) static indeterminacy

b) kinematic indeterminacy

c) sum of static and kinematic indeterminacy

d) none of these.

iii) A uniform cross-section beam of the length $2L$ and flexural rigidity EI is fixed at the ends. The moment required for unit rotation at the centre of span is

a) $\frac{8EI}{L}$ b) $\frac{6EI}{L}$

c) $\frac{4EI}{L}$ d) $\frac{2EI}{L}$.

iv) The force required to produce an unit translation (without rotation) of one third of a fixed beam of span L and uniform flexural rigidity EI is

a) $\frac{729EI}{2L^3}$ b) $\frac{729EI}{L^3}$

c) $\frac{724EI}{L^3}$ d) $\frac{724EI}{3L^3}$.

v) The ratio of stiffness of a beam at the near end when far end is hinged to the stiffness when the far end is fixed, is

a) $\frac{1}{2}$ b) $\frac{3}{4}$

c) 1 d) $\frac{4}{3}$.

vi) The area of influence line diagram for the reaction at the hinged end of uniform propped cantilever is

a) $\frac{L}{2}$ b) $\frac{3L}{8}$

c) $\frac{L}{4}$ d) $\frac{L}{8}$.

vii) In the matrix method of structural analysis ..... are considered as basic unknowns.

a) displacements b) bending moments

c) shear forces d) axial forces.

viii) In portal method of analysis the horizontal shear in any interior column is assumed as ..... of that in an exterior column.

a) twice b) thrice

c) equal d) half.

ix) The critical damping coefficient is given by

a) $C = \sqrt{\frac{K}{m}}$ b) $C = \frac{2m}{n}$

c) $C = 2mp$ d) $C = 2mK$

where, m is the mass, K is the stiffness of the system $P^2 = \frac{K}{m}$.

x) Which one of the following is correct ?

a) $P = \frac{T}{2\pi}$ b) $P = 2\pi f$

c) $T = 2\pi\sqrt{\frac{K}{m}}$ d) $f = \frac{1}{2\pi}\sqrt{\frac{m}{K}}$

where, $P^2 = \frac{K}{m}$.

xi) The maximum value of Dynamic Magnification Factor which is obtained corresponding to tuning factor η is

a) > 1 b) $\cong 1$

c) < 1 d) $= 0$.

xii) In Finite element analysis, linear strain triangle (LST) consists of

a) six nodes b) three nodes

c) ten nodes d) nine nodes.

xiii) In finite element method, the no. of unknowns considered at each end of a beam element is

a) one b) two

c) three d) four.

xiv) The function which relates the field variable at any point within the element to the field variables of nodal points is called

a) polynomial function b) interpolation function

c) shape function d) either (b) or (c).

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following questions. $3 \times 5 = 15$

2. Derive the element stiffness matrix of a typical truss element in the global axis system from fundamentals of finite element displacement approach.

3. Write down the assumptions of cantilever and portal methods of analysis of frames under lateral loads.

4. For a cantilever beam of span '*L*', flexural rigidity '*EI*' and axial rigidity '*AE*', derive the flexibility matrix with co-ordinates, 1, 2 and 3 at the free end when they represent vertical displacement, axial displacement and rotational displacement respectively.

5. Draw the ILD of deflection at '*L*/3' from one end of a simply supported beam of span '*L*'. Show typical ordinates.

6. A cantilever beam of a span '*L*' and constant '*EI*' supports a weight '*W*' via linear spring of stiffness '*k*' at the free end. Determine the expression of time period of vibration of the beam. Assume the beam as massless.

7. Derive from fundamentals the central difference form of expression for d^3y/dx^3.

8. Discuss the critically damped and overdamped systems of vibration with relevant expressions.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following questions. $3 \times 15 = 45$

9. Analyse the following frame by cantilever method. Draw the bending moment diagram.

10. Using matrix stiffness method, analyse the structure shown below, where all members are inextensible. Assume EI to be constant for all members.

11. Analyse the following beam by matrix method using flexibility approach.

12. A propped cantilever of length 30 cm is supported on its tip by a spring having a spring constant 25 N/m and supporting a mass of 100 kg as shown below. Assuming 2% damping ratio, determine natural frequency, damped frequency of the oscillatory motion that the mass will undergo if a small displacement is given to it. Also determine the co-efficient of damping for the system.

Modulus of elasticity for the beam material is 2×10^5 N/mm^2 and moment of inertia for the beam's cross-section is $2{\cdot}52 \times 10^6$ mm^4. Ignore mass of the beam.

13. A beam *AB* of length 10 m whose both ends are fixed is subjected to a u.d.l. of intensity 5 kN/m as shown below. Determine deflections at every quarter points using finite difference method.

14. Analyse the beam shown below by matrix method using stiffness approach.

END