H.T No: | | | | | | | | | | | R22

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : **M.Tech II Semester Regular & Supplementary Examinations August-2025**
Course Name : **Finite Element Analysis**
Course Code : **B420304**
Branch : **Structural Engineering**
Date & Session : **25-08-2025 AN** **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark. **10x1=10M**

1.	Define the term plane strain analysis.	1 M
2.	Write a short note on virtual work formulation.	1 M
3.	Discuss in brief about variational formulation in FEA.	1 M
4.	Write a note on finite element formulation for 2D.	1 M
5.	Discuss the concept of Iso-parametric elements in FEA.	1 M
6.	Describe about the term strain displacement matrix.	1 M
7.	Discuss in short about type of elements in FEA.	1 M
8.	Write a note on weak form of trail function.	1 M
9.	Write a note on simple 2D model.	1 M
10.	Discuss briefly about the commercially available FEA software.	1 M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

11.A).	Explain the basic stress - strain relations of linear elastic materials in the finite element method.	10M
	OR	
11. B).	Discuss in detail the general procedure of FEM formulation with an example.	10M
12. A).	Determine the shape functions N1, N2 and N3 for the triangular element with co-ordinates of (1,3), (5,6) and (4,5) all the units are in meters. Hence determine the value of N1, N2 and N3 at centroid of the element.	10M
	OR	
12. B).	Write a short note on minimum potential energy principle of finite element analysis. Derive the consistent load matrix using minimum potential energy approach.	10M
13. A).	Derive the stiffness matrix for bar element from basic stiffness equation.	10M
	OR	
13. B).	Develop the shape functions for a triangular element with four nodes with isoparametric formulation.	10M
14. A).	Derive the expression for a cantilever beam subjected to a point load "P" at the end having a moment of inertia "I", Young modulus "E" and length of the beam"L" using Galerkin's finite element method.	10M

OR

14. B). Discuss mesh refinement with higher order elements with suitable examples. 10M

15. A). Discuss about the various stages that are involved such as pre-processing and post-processing data in finite element analysis software in detail. 10M

OR

15. B). List out any three software's that are based on finite element analysis in structural engineering and explain about any two in detail. 10M

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H.T No: | | | | | | | | | | | R22

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **M.Tech II Semester Regular & Supplementary Examinations Aug/Sept-2025**
Course Name : **Special Concretes**
Course Code : **B420411**
Branch : **Structural Engineering**
Date & Session : **02-09-2025 AN** **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark. **10x1=10M**

1. Define workability of concrete. 1 M
2. Mention the patterns of slump and draw the figures. 1 M
3. Define high performance concrete. 1 M
4. What are the properties of high strength concrete? 1 M
5. Name the types of polymer concrete. 1 M
6. What is Reactive powder concrete? 1 M
7. Mention the basic steps involved the designing the mix proportions. 1 M
8. Why mix design of concrete is necessary? 1 M
9. What are the major causes of corrosion of Reinforcement in concrete. 1 M
10. Why Concrete Testing is necessary? 1 M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

11.A). i) List the various workability tests conducted on fresh concrete and explain any one test. 5M
ii) Discuss the significance of each test in evaluating the performance of concrete. 5M

OR

11. B). i) Explain the stress-strain behavior of hardened concrete. 5M
ii) Discuss the factors influencing the stress-strain curve and its importance in structural design. 5M

12. A). Explain the role of mineral admixtures and chemical admixtures in achieving the properties of high-performance concrete. 10M

OR

12. B). Explain the key design considerations for high-strength concrete, including the role of aggregate selection and water-cement ratio. 10M

13. A). Define self-compacting concrete (SCC). Describe the requirements and materials used in SCC. Discuss the different tests used to evaluate its properties, such as workability, segregation resistance, and flowability. 10M

OR

13. B). What is polymer concrete? Explain the materials used, the properties that make it distinct from traditional concrete, and the advantages it offers in specific environments. Discuss its applications and limitations. 10M

(P.T.O..)

14. A). Design a M20 concrete mix using IS method of Mix Design for the following data: 10M

i) Type of Cement and Grade of cement: OPC43 Grade
ii) Max. Nominal Size of Aggregate-20mm
iii) Exposure Condition-Mild
iv) Minimum Cement Content-300kg/m 3
v) Workability in terms of Slump-100mm
vi) Maximum cement content-450kg/m 3
vii) Fine aggregate-Zone-II
viii) Specific Gravity of Fine Aggregate, Course
ix) Aggregate, and Cement:2.46, 2.73 and 3.16

Assume any other data required suitably.

OR

14. B). Explain the DOE method of mix design and its applications. 10M

15. A). Explain the procedure following test in detail, along with importance, advantages and disadvantages of Tests. 10M

(i) Hall Cell Potential.

(ii) Rapid chlorie penetration test.

OR

15. B). i) Define Non-destructive Testing and explain any one Non-destructive test. 5M

ii) Explain the procedure of Macro cell corrosion test. 5M

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H.T No: | | | | | | | | | | | R22

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **M.Tech II Semester Regular & Supplementary Examinations Aug/Sept-2025**
Course Name : **Structural Dynamics**
Course Code : **B420305**
Branch : **Structural Engineering**
Date & Session : **04-09-2025 AN** **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark. **10x1=10M**

1. Discuss briefly about the methods of discretization. 1 M
2. Write a short note on principle of virtual work. 1 M
3. Define the term critical damping. 1 M
4. Define the term logarithmic decrement. 1 M
5. Write a short note on mode shapes. 1 M
6. Write a short note undamped free vibration. 1 M
7. Write a short note on Holzor method. 1 M
8. Discuss briefly about second and higher order modes. 1 M
9. Discuss briefly about the flexural vibrations of beams. 1 M
10. Define the term natural frequency. 1 M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

11.A). Discuss briefly about the formulation of equations of motion by different methods. 10M

OR

11. B). Discuss in detail about the theory of vibrations and lumped mass idealization. 10M

12. A). A machine foundation weighs 60 KN. The spring constant is 11000KN/m and dash pot constant (C) = 200 KN-s/m. Explain i) Whether the system is over damped, under damped or critically damped. ii) Determine Logarithmic decrement. 10M

OR

12. B). Derive expression for response of SDOF system subjected to undamped free vibration. 10M

13. A). Derive the solutions for the equation of motion for an undamped free vibration of MDOF system. 10M

OR

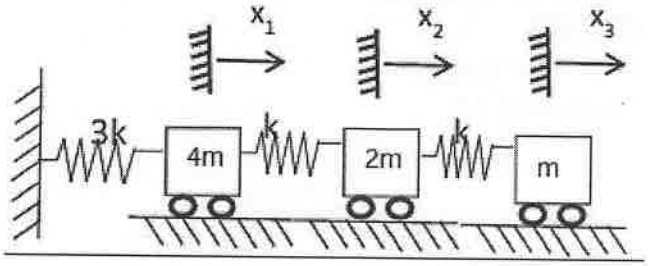
13. B). Write down the Fourier series for periodic loading. Also Compare orthogonality and normality principles. 10M

(P.T.O..)

14. A). Explain in detail about Holzer's method for vibration analysis. Also discuss in short about the process of practical vibrational analysis. 10M

OR

14. B). For the three degree of freedom system shown below, find the lowest natural frequency by Stodola's method. 10M



15. A). Derive the equation for the undamped free vibrations of a beam in flexure. 10M

OR

15. B). Develop the expressions for first three natural frequencies and draw mode shapes for simply supported beams. 10M

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H.T No: | | | | | | | | | | | R22

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination : **M.Tech II Semester Regular & Supplementary Examinations August-2025**
Course Name : **Advanced Structural Steel Design**
Course Code : **B420407**
Branch : **Structural Engineering**
Date & Session : **08-09-2025 AN** **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark. **10x1=10M**

1. What is throat thickness in welded connection? 1 M
2. What is the efficiency of a joint? 1 M
3. Define plastic hinge. 1 M
4. How many number of plastic hinges are required to form a mechanism in a fixed beam subjected to point load at mid-span? 1 M
5. When do you prefer framed connection? 1 M
6. What is a type 1 bracket connection? 1 M
7. What are the primary functions of purlins in roof trusses? 1 M
8. What is pitch in roof trusses? 1 M
9. What is the fuller formula to determine the self weight of girders? 1 M
10. List any two types of trusses commonly used in bridge construction. 1 M

PART-B

Answer the following. Each question carries TEN Marks. **5x10=50M**

11.A). i) Differentiate between lap joint and butt joint. 5M
ii) Explain the prying action in bolted connections. 5M

OR

11. B). Two plate of sizes 200mm × 12mm and 200mm × 14mm are to be joined by butt welding. Find the strength of joint if 10M
i) it is fully penetrated
ii) it is partially penetrated.

12. A). A two span continuous beam ABC consists of span AB= 6 m and span BC= 5m. The supports A and C are simply supported, and support B is continuous. Span AB is subjected to uniform distributed load of 10 kN/m throughout the span and a point load of 25 kN is acting at mid span of span BC. Determine the maximum plastic moment. 10M

OR

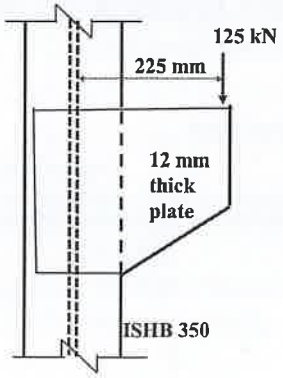
12. B). Explain about the different methods of plastic analysis. 10M

(P.T.O..)

13. A). Explain and detailed design procedure for the stiffened seat connections. 10M

OR

13. B). Design the welded bracket connection subjected to an eccentric load as shown in figure. 10M



14. A). Determine the design forces for an angular roof truss for an industrial building with a span of 20 m and a rise of 5m. The truss is subjected to a dead load of 1.5 kN/m^2, live load of 0.75 kN/m^2, and wind load as per IS875 : Part 3. Assume the basic wind speed is 50 m/s and the terrain category is 2. Use Fe410 grade steel. 10M

OR

14. B). Design a purlin for a roof truss having the following data: Span of the truss = 6m; Spacing of truss = 3m c/c; Inclination of roof = 30°; Spacing of Purlin = 2m c/c; Wind pressure = 1.5 kN/m^2; Roof coverage= A.C Sheeting weighing 200 N/m^2. Provide a channel section Purlin. 10M

15. A). i) Explain the functions of different types of braces of a through type truss bridge. 5M

ii) What are differences between through type and deck type truss bridges? 5M

OR

15. B). A steel bridge consists of a Pratt truss, 6 panels @ 4m. each, height of the truss is 5.5m. The bridge supports an equivalent uniformly distributed live load of 200 kN/m. The dead load transmitted inclusive of the self weight of the truss is 30kN/m. Take the impact factor as 15 %. Design the top chord, bottom chord members of the second panel from left. 10M

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