CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : **M.Tech II Semester Supplementary Examinations March-2025**
Course Name : **Structural Dynamics**
Course Code : **B420305**
Branch : **Structural Engineering**
Date & Session : **20-03-2025 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 Natural period.	1 M
2.	What is dynamic magnification factor.	1 M
3.	Define transmissibility in the context of vibration analysis.	1 M
4.	What is the significance of the frequency of harmonic excitation in a vibrating system?	1 M
5.	How does an MDOF system differ from a single-degree-of-freedom (SDOF) system?	1 M
6.	What is the purpose of solving eigenvalue problems in the analysis of MDOF systems?	1 M
7.	In what situations is the Stodola method particularly useful?	1 M
8.	Why is the fundamental mode often the most significant in structural analysis?	1 M
9.	How does flexural vibration differ from axial or torsional vibration in beams?	1 M
10.	What is the governing differential equation of motion for a vibrating beam?	1 M

PART-B
Answer the following. Each question carries TEN Marks.　　　5x10=50M

11.A). i) Briefly explain fundamental objectives of dynamic analysis with example. 　5M
　　　ii) Develop the expression for time period of simple harmonic motion. 　5M

OR

11. B). Explain Simple harmonic motion and D'Alemberts principles. 　10M

12. A). The natural period of a SDOF system is 0.75 sec. The system is subjected to some initial　10M displacement of 25mm and allowed to vibrate its own. The displacement observed after 2.5 sec was 10 mm. If the mass of the system is 500kg, determine a) circular natural frequency, b) stiffness, c) damping ratio, d) damped circular natural frequency and e) critical damping coefficient of the system f) period and frequency of vibration.

OR

12. B). State and explain D'Alemberts principle? Derive the equation of motion and expression　10M for x(t) for the free undamped vibration of SDOF system.

13. A). i) Explain the concept of mode superposition method with example. 　5M
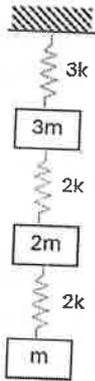　　　ii) What is meant by normalization? Define fundamental mode and characteristic　5M equation.

(P.T.O..)

<p style="text-align: center">**OR**</p>

13. B). Determine the two degrees of freedom system shown in figure 2, $k_1 = k$, $k_2 = 2k$, $m_1 = m$ and $m_2 = 2m$. Find the angular frequencies, the corresponding mode shapes and the equations of motion: 10M
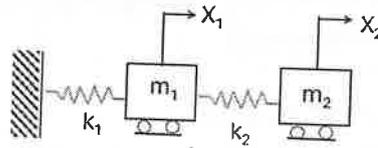
14. A). Find the lowest natural frequency by Stodola's method, For the given system.   10M

<p style="text-align: center">**OR**</p>

14. B). What is the Holzer method used for in the context of vibration analysis? Describe the basic procedure of the Holzer method for determining natural frequencies.   10M

15. A). Analyze the influence of boundary conditions on the natural frequency and mode shapes for a uniform beam with one end fixed and the other end simply supported.   10M

<p style="text-align: center">**OR**</p>

15. B). Derive the first mode shape of simply supported beam of continuous system.   10M

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Examination	:	M.Tech II Semester Supplementary Examinations March-2025
Course Name	:	Advanced Structural Steel Design
Course Code	:	B420407
Branch	:	Structural Engineering
Date & Session	:	22-03-2025 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

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1.	How is slip critical connection achieved?	1 M
2.	What is tensile strength of bolt?	1 M
3.	When is strain hardening action occurred?	1 M
4.	Mention the design criteria in plastic method.	1 M
5.	What are bolted bracket connections?	1 M
6.	Define cleat angle.	1 M
7.	What is the correct orientation of placement of channel section purlins over roof trusses?	1 M
8.	Mention the secondary stresses in roof trusses.	1 M
9.	List out the different types of truss girder bridges.	1 M
10.	Mention the assumptions for the design of truss bridges.	1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Calculate the strength of a 22 mm diameter bolt of grade 4.6 for the following cases. The main plates to be jointed are 10 mm thick. (a) Lap joint (b) Single cover butt joint; the cover plate being 10 mm thick (c) Double cover butt joint; each of the cover plate being 8 mm thick.   10M

OR

11. B). Two ISF sections 210 mm x 10 mm each and 1.5 m long are to be jointed to make a member length of 2.5 m. Design a butt joint with the bolts arranged in the diamond pattern. The flats are supposed to carry a factored tensile force of 450 kN. Steel is of grade Fe 410. 18 mm diameter bolts of grade.4.6 are used to make the connection.   10M

12. A). A fixed ended beam is subjected to load W at 1/3rd span as shown in below figure Estimate the collapse load.   10M
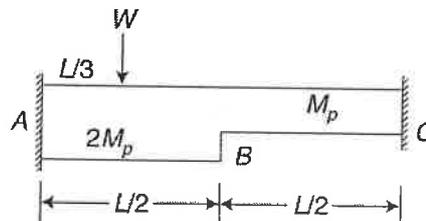
OR

12. B) Explain stress-strain and moment curvature relationships and the types of mechanisms.   10M

(P.T.O..)

13. A). Design a stiffened seat connection for an ISMB 350 @ 514 N/m transmitting an end reaction of 320 kN (due to factored loads) to a column section ISHB 300 @ 576.8 N/m. The steel is of grade Fe 410 and bolts of grade 4.6   10M

OR

13. B). Explain and detail design procedure for the stiffened seat connections.   10M

14. A). The sliding end of a roof truss rests of 450 mm brick wall through a concrete bearing pad. The maximum normal reaction of the bearing is 90 kN. The principal rafter is inclined at 30 degrees to the main tie which is horizontal. If the panel length of the principal rafter is 1 m, design rafter, the tree and the sliding joint.   10M

OR

14. B). Design the principal tie member of a fink type roof truss for the following data. Design also its connection with a 20 mm thick gusset plate using 15 mm diameter bolts of grade 4.6. Use steel of grade Fe 410. Design tensile force 270 kN (due to D.L and L.L) Design compressive force 45 kN (due to D.L and W.L).   10M

15. A). The effective span of a through type truss girder highway through two lane bridge is 64 m. The reinforced concrete slab is 250 mm thick inclusive of the wearing coal. The foot paths are provided on either side of the carriageway. The spacing between centre to centre of truss girder is 13 m. Suggest a suitable truss girder for the bridge. The highway bridge is to carry IRC class A standard loading.   10M

OR

15. B). The effective span of a through type Pratt truss girder railway bridge for a single broad gauge track is 50 m. Pratt truss girder consists of 10 panels @ 5 m. The height of girder between c.g. to c.g. of chords is 6 m. The spacing between main truss girders is 7 m. The rail level is 800 mm above the c.g. of bottom chord. The chord members are 600 mm deep × 644 mm wide. The inner web members are 600 mm deep × 260 wide. The end posts are 600 mm deep × 644 mm wide. Determine the increase or decrease of forces in the central chord member of the leeward truss girder in the following cases :   10M

(i) Overturning effect due to wind, when the bridge is unloaded.

(ii) Lateral effects of top chord and bottom chord bracings, when the bridge is unloaded.

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Examination : M.Tech II Semester Supplementary Examinations March-2025
Course Name : Special Concretes
Course Code : B420411
Branch : Structural Engineering
Date & Session : 25-03-2025 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.	Name the workability tests on normal concrete.	1 M
2.	Define bleeding of concrete.	1 M
3.	Define high strength concrete.	1 M
4.	State the role of admixtures in concrete	1 M
5.	What are light weight aggregates?	1 M
6.	Mention the application of polymer concrete	1 M
7.	Define Quality control & Quality assurance in concrete.	1 M
8.	List the various methods of proportioning.	1 M
9.	List the corrosion testing methods.	1 M
10.	What is the key difference between Destructive and Nondestructive testing methods?	1 M

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

11.A). Discuss the different tests used to measure the workability of self-compacting concrete (SCC). How do these tests ensure the quality of SCC? State the Difference between conventional concrete and SCC.   10M

OR

11. B). i) Explain creep and shrinkage in hardened concrete.   5M
ii) Discuss the factors affecting these properties and their impact on long-term performance.   5M

12. A). Define high-performance concrete (HPC). Discuss the requirements and properties that make it distinct from conventional concrete.   10M

OR

12. B). Compare and contrast high-performance concrete (HPC) and high-strength concrete (HSC) in terms of their properties, applications, and design requirements.   10M

13. A). Explain the concept of lightweight concrete. Discuss its composition, types of lightweight aggregates, and the properties that differentiate it from conventional concrete. Highlight its advantages, disadvantages, and typical applications in construction   10M

OR

13. B). Explain fiber-reinforced concrete (FRC) in detail. Describe the different types of fibers used in FRC, their effects on concrete properties, and their applications. Discuss the benefits of using FRC in terms of durability, strength, and crack resistance.   10M

(P.T.O..)

14. A). Explain the step-by-step procedure of concrete mix design using the BIS method (IS 10262-2019). 10M

OR

14. B). Explain in detail about the factors that influence the mix design. Also mention about the main objective of concrete mix designing. 10M

15. A). Describe the Ultrasonic Pulse Velocity Test and its application in evaluating concrete structures. 10M

OR

15. B). i) What are the effects of concrete when exposed to acidic environment?
ii) Explain the concept of following Evaluations.
   (a) Dynamic Shear   (b) Young's Modulus. 5M 5M

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