

**B.Tech DEGREE EXAMINATION, NOVEMBER 2023**

Fifth Semester

**18CEO308J - STRUCTURAL ENGINEERING SOFTWARE APPLICATIONS***(For the candidates admitted during the academic year (2020-2021 & 2021-2022))***Note:**

- i. **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40<sup>th</sup> minute.
- ii. **Part - B** and **Part - C** should be answered in answer booklet.

**Time: 3 Hours****Max. Marks: 100****PART - A (20 × 1 = 20 Marks)****Marks BL CO**

Answer all Questions

- |  |   |   |   |
|--|---|---|---|
| 1. The maximum spacing of shear reinforcement (vertical stirrup) measured along the axis of the member shall not exceed<br>(A) 0.75d<br>(B) 0.5d<br>(C) 0.65d<br>(D) 0.4d  | 1 | 1 | 1 |
| 2. The design of the projecting parts during the construction of earthquake resistant building should be as per<br>(A) IS 1893:2016<br>(B) IS 1893:2019<br>(C) IS 1893:2001<br>(D) IS 1893:2004                                      | 1 | 1 | 1 |
| 3. The seismic zone factor (Z) for zone v is<br>(A) 0.16<br>(B) 0.36<br>(C) 0.24<br>(D) 0.15   | 1 | 1 | 1 |
| 4. The diameter of lateral ties in no case should not be less than<br>(A) 2 mm<br>(B) 5 mm<br>(C) 10 mm<br>(D) 12 mm   | 1 | 1 | 1 |
| 5. Which of the following relation is correction for design wind speed ( $V_z$ ) and basic wind speed ( $V_b$ )?<br>(A) $V_z \propto V_b^2$<br>(B) $V_z \propto 1/V_b^2$<br>(C) $V_z \propto V_b$<br>(D) $V_z \propto 1/V_b$         | 1 | 2 | 2 |
| 6. As per the Indian code of practice, open terrain with well scattered obstructions having height generally between 1.5 m to 10 m is under the category of,<br>(A) Category 1<br>(B) Category 3<br>(C) Category 2<br>(D) Category 4 | 1 | 1 | 2 |
| 7. The pre-engineered buildings will offer<br>(A) Less temperature variation<br>(B) less material unit cost<br>(C) uniform settlement<br>(D) large column free area  | 1 | 1 | 2 |
| 8. Response reduction factor for a steel frame with concentric braces is<br>(A) 2<br>(B) 3<br>(C) 1<br>(D) 5   | 1 | 1 | 2 |
| 9. The Importance factor for the drinking water liquid storage tank is<br>(A) 1.5<br>(B) 1<br>(C) 2.5<br>(D) 2   | 1 | 1 | 3 |
| 10. Minimum grade of concrete for designing RCC water tank is<br>(A) M30<br>(B) M20<br>(C) M15<br>(D) M25  | 1 | 1 | 3 |

11. For serviceability requirement permissible crack in water tank for the aggressive environment is? (A) 0.2 mm (C) 0.4 mm	(B) 0.1 mm (D) 0.5 mm	1	1	3
12. If W is the load on a circular slab of radius R, the maximum circumferential moment at the centre of the slab, is (A) $16WR^2/18$ (C) $WR^2/3$	(B) $3WR^2/16$ (D) $WR^2/16$	1	1	3
13. Either Uniformly distributed load is longer than the span or uniformly distributed load is shorter than the span. Depending upon the length of the load and span, the maximum shear in beam supporting UDL will (A) Zero (C) Change	(B) same (D) one	1	1	4
14. The maximum bending moment due to train of wheel loads on a simply supported girder (A) Always occurs at center of span (C) Always occurs under wheel load	(B) Never occurs under wheel load (D) Always occurs at support	1	1	4
15. An influence line diagram with numerical values of its ordinates is known as a (A) unit load ILD (C) Qualitative ILD	(B) Descriptive ILD (D) Quantitative ILD	1	1	4
16. The maximum bending moment under a particular load moving among the several moving loads on a simply supported beam occurs when the point load is placed (A) At mid span (C) At quarter point	(B) At one third point (D) At a point when CG of all loads and particular load is equidistant from mid-span	1	1	4
17. The numbers of node for 1 D element are (A) 2 (C) 3	(B) 1 (D) 0	1	1	5
18. In FEA softwares, the output can be taken at the stage of (A) Post processing (C) Meshing	(B) Contact modelling (D) Geometrical Modelling	1	1	5
19. Example of 2-D Element is (A) Bar (C) hexahedron	(B) Triangle (D) tetrahedron	1	1	5
20. Which of the following is not an FEA package? (A) ANSYS (C) ABAQUS	(B) Nastran (D) AutoCAD	1	1	5

**PART - B ( $5 \times 4 = 20$  Marks)**

Answer any 5 Questions

21. Write the load combination for seismic analysis of building as per IS 456?	4	2	1
22. Sketch a pre engineered truss and label its parts	4	2	2
23. What are the types of water tank and its uses ?	4	1	3
24. The absolute maximum bending moment in a simply supported beam of span 20 m due to moving UDL of 4 kN/m spanning over 5 m is	4	1	4
25. A simply supported girder has a span of 12 m. A 200 kN wheel load moves from one end to other end on the span of the girder. Find the maximum bending moment which can occur at a section 4 m left end.	4	1	4

26. Why is meshing done in FEA?	4	1	5
27. What are factors need to consider for the optimum orientation of building?	4	1	1

**PART - C (5 × 12 = 60 Marks)**

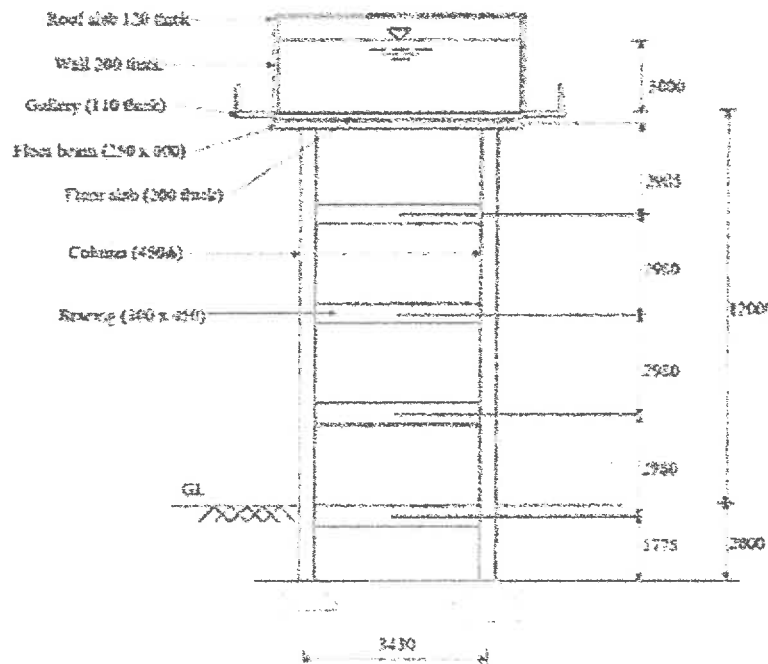
Answer all Questions

**Marks BL CO**

28.	(a) Calculate the design seismic force of the building is located in Chennai. The building is G+3. The height between foundation and plinth is 6 m and the floor-to-floor height 3 m. In the plan, the x direction is having 4 bays with each bay of 4 m and the z direction is having 3 bays with each bay of 5 m. The soil conditions are medium stiff and the entire building is supported on a raft foundation. The R. C. frames are infilled with brick-masonry. The lumped weight due to dead loads is 13.8 kN/m <sup>2</sup> on floors and 6 kN/m <sup>2</sup> on the roof. The floors are to cater for a live load of 3 kN/m <sup>2</sup> on floors and 1 kN/m <sup>2</sup> on the roof. Determine design seismic load on the structure as per IS 1893.	12	3	1
	(OR)			
	(b) Calculate the design wind force of the building (as per IS875 PART 3) is located in Chennai. The building is G+9. The height between foundation and plinth is 6 m and the floor-to-floor height 3 m. Parapet wall height is 1 m. In the plan, the x direction is having 4 bays with each bay of 4 m and the z direction is having 3 bays with each bay of 5 m. Design life of the structure is 100 years.			
29.	(a) A single storey workshop building situated in the industrial area is 16m x 12m and it is to be provided with sloping roof. The centre to centre spacing of truss is 4m. The sloping roof has a span 12 and pitch ¼ span. The height of eaves 5m above the ground level. The building situated in Mumbai and its permeability is normal. Calculate the wind force parallel and normal to ridge line..	12	1	2
	(OR)			
	(b) Write the step by step procedure for the seismic base shear calculation of industrial building.			

30. (a) A RC circular water container of  $50 \text{ m}^3$  capacity has internal diameter of 4.65 m and height of 3.3 m (including free board of 0.3 m). It is supported on RC staging consisting of 4 columns of 450 mm dia with horizontal bracings of  $300 \times 450 \text{ mm}$  at four levels. The lowest supply level is 12 m above ground level. Staging columns have isolated rectangular footings at a depth of 2m from ground level. Tank is located on soft soil in seismic zone II. Grade of staging concrete and steel are M20 and Fe415, respectively. Density of concrete is  $25 \text{ kN/m}^3$ . Analyze the tank for seismic loads.

12 4 3

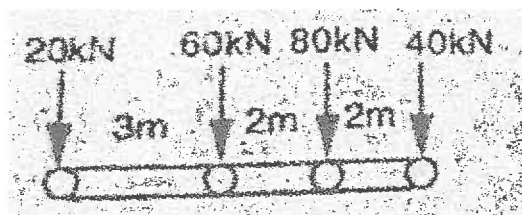


(OR)

- (b) Write the general design requirement for the design of water tank

31. (a) A train of concentrated load as shown in figure moves from left to right on a simply supported girder of span 16 m. Determine the absolute maximum shear force.

12 3 4



(OR)

- (b) Two wheel load of 10 and 20 kN at a distance of 1 m apart cross a span of 20 m. Find the maximum bending moment at 6 m from left support.

32. (a) Explain pre-processing and post processing in FEA softwares

12 2 5

(OR)

- (b) Write in detail about concrete damage plasticity model

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