CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	B.Tech VI Semester Regular Examinations June-2025
Course Name	:	Structural Engineering-II
Course Code	:	A401315
Branch	:	Civil Engineering
Date & Session	:	19-06-2025 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.	Enumerate the different limit states as per code.	1 M
2.	What is the efficiency of the joint?	1 M
3.	In what situation lacing is provided in columns?	1 M
4.	What is a lug angle?	1 M
5.	What is a plastic moment?	1 M
6.	In what situations are built up sections considered?	1 M
7.	Give the expression for economical depth of a plate girder.	1 M
8.	What are the elements of the plate girders?	1 M
9.	How are the live loads considered in the roof truss design?	1 M
10.	What is the primary function of purlin in a roof truss?	1 M

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

11.A). i) Discuss the important factors that influence the mechanical properties of steel. Sketch the typical stress-strain curve of steel, indicating salient regions. — 5M

ii) Discuss in detail about the limit state design of steel structures. — 5M

OR

11. B). Two plates of sizes 220mm × 12mm and 220mm ×14mm are to be joined by butt welding. Find the strength of joint if i) it is fully penetrated   ii) it is partially penetrated. — 10M

12. A). Design a double angle tension member connected on each side of a 12 mm thick gusset plate, to carry a axial factored load of 450 KN. Use 20 mm bolts. Take yield stress of material as 250 N/mm. — 10M

OR

12. B). Design a laced column with two channel sections placed toe to toe of 10 m length to carry an axial load of 750 kN. The column is restrained in position but not in direction at both the ends. — 10M

13. A). Write a design procedure of bending strength for laterally supported beams. — 10M

(P.T.O..)

OR

13. B). A simply supported steel joist with an effective span of 5.0 m, carries a uniformly distributed load of 50 kN over its span inclusive of its self-weight. The beam is supported laterally throughout. Select a suitable section and check its safety.   10M

14. A). A welded plate girder is made up of 2500 × 12 mm web plate, flange plate of 500 × 50 mm. The girder has a span of 35 meters. It carries a load of 50 kN/m inclusive self-weight over the span. Design the intermediate stiffener. Draw the cross section and longitudinal elevation of plate girder.   10M

OR

14. B). A simply supported plate girder of span 16 m has Top flange: 300 mm × 22 mm, Bottom flange: 250 mm × 22 mm and web: 900 mm × 10 mm. The plate girder is subjected to a concentrated load of 400 kN at its mid-span. Design the bearing stiffener. Adopt the length of bearing is 200 mm.   10M

15. A). Design a purlin for a roof truss having the following data: 10M
Span of the truss = 10m, spacing of truss = 5m c/c, Inclination of roof = 35°, Spacing of Purlin = 3m c/c, Wind pressure = 2.0 kN/m^2, Roof coverage= A.C Sheeting weighing 200 N/m^2, Provide a channel section for Purlin

OR

15. B). i) Explain the calculation of wind load considered in the design of roof trusses.   5M
ii) Explain types of trusses available for roofs with neat sketches.   5M

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Examination	:	B.Tech VI Semester Regular Examinations June-2025
Course Name	:	Environmental Engineering
Course Code	:	A401316
Branch	:	Civil Engineering
Date & Session	:	21-06-2025 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.	List out the various sources of water supply.	1 M
2.	What is an intake?	1 M
3.	What are the common coagulants used in water treatment?	1 M
4.	What is coagulation?	1 M
5.	List out the sources of domestic sewage.	1 M
6.	List out the types of sewerage system.	1 M
7.	What is the function of primary settling?	1 M
8.	What are the objectives of screen chamber?	1 M
9.	Elaborate the term ESP.	1 M
10.	Which air pollution control device is known for its high efficiency?	1 M

PART-B
<u>Answer the following. Each question carries TEN Marks.</u>

5x10=50M

11.A).	Explain about different source of water with reference to quantity & quality.	10M

OR

11. B).	The populations of a town in 1960, 1970, 1980 and 1950 are 58,000, 75,000, 90,000 and 1,35,000 respectively. Find the population in 2030 using arithmetic, geometric and incremental increase methods.	10M

12. A).	Design a coagulation-cum-sedimentation tank with continuous flow for a population of 60,000 persons with a daily percapita water allowance of 120 liters. Make suitable assumptions where needed.	10M

OR

12. B).	i) Outline comparison of slow and rapid sand filter.	7M
	ii) Write short note on chlorine demand and break point chlorination.	3M

13. A).	List out sewer appurtenances. Explain any three with neat sketches.	10M

OR

13. B).	i) Define BOD. Derive the first stage BOD.	5M
	ii) Determine ultimate BOD for a sewage having 5-day BOD at 20°C as 160mg/l. Assume the deoxygenation constant as 0.2 per day.	5M

(P.T.O..)

14. A). Construct the sequence of units in waste water treatment plant and indicate the objectives of each unit in the sequence. 10M

OR

14. B). Write a short note on the following elements: 10M
   i) Grit chambers ii) Skimming tanks and iii) Trickling filters.

15. A). i) Explain in detail about meteorological factors of air pollution. 7M
   ii) Summarize different sources of air pollution. 3M

OR

15. B). i) Explain the working principle and construction of Electrostatic precipitator with a neat sketch. 6M
   ii) List various advantages and disadvantages of Electrostatic precipitators. 4M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	B.Tech VI Semester Regular Examinations June-2025
Course Name	:	Foundation Engineering
Course Code	:	A401317
Branch	:	Civil Engineering
Date & Session	:	24-06-2025 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 any two types of samplers.	1 M
2.	What is the objective of soil exploration?	1 M
3.	What is the difference between Standard Method of Slices and Bishop's Simplified method?	1 M
4.	What is meant by slope factor of safety?	1 M
5.	What is the formula to determine the active earth pressure behind a retaining wall due to surcharge?	1 M
6.	State Active and Passive Earth pressure.	1 M
7.	Distinguish between bearing capacity and ultimate bearing capacity.	1 M
8.	Classify the components of settlement.	1 M
9.	What is pile foundation?	1 M
10.	What causes negative skin friction?	1 M

PART-B
Answer the following. Each question carries TEN Marks.

5x10=50M

11.A). Explain standard penetration test and corrections applied to it.   10M

OR

11. B). Explain in detail about preparation of soil investigation report including record of boring.   10M

12. A). i) Determine the safe height of a slope which is to be constructed at an angle of 30° with the horizontal. The required factor of safety with respect to both cohesion and angle of internal friction is 1.5, and the soil has the following properties C= 10 kN/m², φ =22° and γ = 20 kN/m³. Taylor's stability numbers for mobilized friction angles of 22° and 15° are 0.016 and 0.046 respectively.   5M

ii) Explain the types of slopes failures with neat sketches.   5M

OR

12. B). An infinite slope is to be constructed in a soil with a thickness of 2 m. The effective stress strength parameters of the soil are c' = 0 and φ=30°, the saturated unit weight of the slope is 20kN/m³ and the unit weight of water is 10kN/m³. Assuming that seepage is occurring parallel to the slope, Determine the maximum slope angle for a factor of safety of 1.5.   10M

13. A). A retaining wall 9 m high retains a cohesion less soil, with an angle of internal friction 33°. The surface is level with the top of the wall. The unit weight of the top 3 m of the fill is 21 kN/m³ and that of the rest is 27 kN/m³. Find the magnitude and point of application of the resultant active thrust.   10M

(P.T.O..)

13. B). Compute the intensities of active and passive earth pressure at depth of 8 meters in dry cohesionless sand with an angle of internal friction of 30° and unit weight of 18kN/m³. What will be the intensities of active and passive earth pressure if the water level rises to the ground level? Take γ_{sat}= 22kN/m³.   10M

14. A). A strip footing, 1m wide at its base, is located at a depth of 0.8m below the ground surface. The properties of the foundation soil are: γ= 18kN/m³, c=30kN/m² and φ=20°. Determine safe bearing capacity using Terzaghi's analysis. Assume that soil fails by local shear. (Take F.S=3.0, Nc=11.8, Nq=3.9 and Nγ=1.7).   10M

OR

14. B). With the help of neat sketches, explain different types of shallow foundation.   10M

15. A). A square group of 9 piles was driven into soft clay extending to a large depth. The diameter and length of the piles were 30 cm and 9 m respectively. If the unconfined compression strength of the clay is 90 kN/m², and the pile spacing is 90 cm centre to centre, what is the capacity of the group? Assume a factor of safety of 2.5 and adhesion factor of 0.75.   10M

OR

15. B). Explain the procedure, importance and advantages of pile load test with neat sketch.   10M

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Examination	:	B.Tech VI Semester Regular Examinations June-2025
Course Name	:	Pavement Analysis and Design
Course Code	:	A401318
Branch	:	Civil Engineering
Date & Session	:	26-06-2025 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 equivalent axle load (EAL).	1 M
2.	What is the effect of transient load on pavements?	1 M
3.	List the types of stresses considered in pavement analysis.	1 M
4.	Why is a three-layer system considered in pavement stress analysis?	1 M
5.	Write the importance of climate in pavement design.	1 M
6.	What is the function of a dowel bar?	1 M
7.	Define Geosynthetic material and write any three concepts of geosynthetics.	1 M
8.	Compare natural and modified binders.	1 M
9.	Define low-volume road as per IRC.	1 M
10.	What is the need for overlay design?	1 M

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

11.A). Explain various types of pavements with merits and demerits of each type with a neat   10M
sketch showing the cross-section and also explain functions of each layer.

OR

11. B). The following data is obtained from the axle load survey conducted for 3 days. Determine   10M
the equivalent number of standard axle loads 80kN repetitions per year.

Axle load(kN)	30-40	40-50	50-60	60-70	70-80	80-90
No of axles	54	65	64	78	103	98
Axle load(kN)	90-100	100-110	110-120	120-130	130-140	140-150
No of axles	110	98	78	89	67	79

12. A). List the assumptions of the layered system along with the calculations of deflections in   10M
Burmister's one-layered system.

OR

12. B). Calculate the stresses at interior, edge, and corner regions of CC Pavement using   10M
Westergaard's stress equations. Use the following data:
Design wheel load = 5100kg, Modulus of elasticity of cement concrete = 2.1×10^5 kg/cm^2,
Thickness of pavement = 15cm, Poisson's ratio = 0.15, Modulus of subgrade reaction =
6.0kg/cm^3, Radius of contact area=15cm.

(P.T.O..)

13. A). Differentiate between AASHTO and IRC methods of rigid pavement design. 10M

OR

13. B). Explain thoroughly about prestressed and continuously reinforced cement concrete in pavement design. 10M

14. A). Identify and explain different Geo-textile materials used in soil stabilization for pavement construction. 10M

OR

14. B). Explain various effects and methods of stabilization and use of Geosynthetics. 10M

15. A). Explain the factors governing the construction of cement concrete pavements for low volume roads as per IRC. 10M

OR

15. B). Describe the method of design of overlays for flexible pavement as per IRC guidelines. 10M

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Examination	:	B.Tech VI Semester Regular Examinations June-2025	
Course Name	:	Prestressed Concrete	
Course Code	:	A401405	
Branch	:	Civil Engineering	
Date & Session	:	28-06-2025 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. Differentiate between prestressing and conventional reinforcement.   1 M
2. Explain in brief the general principles behind prestressing in concrete structures.   1 M
3. What are the two main methods of prestressing? Explain any one in brief.   1 M
4. What is meant by "slip in anchorage" in the context of prestress losses?   1 M
5. Define the kern line in a PSC section.   1 M
6. What is a stress diagram in the context of flexural analysis?   1 M
7. Define transmission length in the context of pretensioned concrete.   1 M
8. What are anchorage zone stresses in post-tensioned members?   1 M
9. What are composite beams in prestressed concrete?   1 M
10. How does differential shrinkage affect the behavior of composite beams?   1 M

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

11.A). Explain the historical development of prestressed concrete. How has it evolved over time and what are its major milestones?   10M

OR

11. B). Explain the classification and different types of prestressing techniques used in construction.   10M

12. A). Discuss the McCall and Lee-McCall systems of prestressing. Highlight their key features and typical areas of application.   10M

OR

12. B). A pre-tensioned concrete beam, 250 mm wide and 350 mm deep, is prestressed by straight wires carrying an initial force of 200 kN at an eccentricity of 50 mm. Assume modulus of elasticity of steel as 2×10^5 N/rnrn^2 and that of concrete as 0.33×10^5 N/mm^2 respectively. Estimate the percentage loss of stress in steel due to elastic deformation of concrete if the area of steel wires is 200 mm^2.   10M

13. A). A rectangular concrete beam of cross-section 300mm and 400 mm deep is prestressed by means of 18 wires of 5 mm diameter located 70mm from the bottom of the beam and 4 wires of diameter of 5 mm, 25mm from the top. Assuming the prestress in the steel as 1000 N/mm^2, calculate the stresses at the extreme fibers of the mid-span section when the beam is supporting its own weight over a span of 8 m. If a uniformly distributed live load of 8kN/m is imposed, evaluate the maximum working stress in concrete. The density of concrete is 24kN/m.   10M

(P.T.O..)

OR

13. B). A concrete beam of rectangular section 300mm 800mm deep is prestressed by a parabolic cable at an eccentricity of 120mm at mid span and zero at support. If the beam has a span of 12m and carries a live load of 8 kN/m. Find the effective force necessary in cable for zero shear stress at support section. For this condition, calculate the permissible stresses.   10M

14. A). Discuss flexural bond stresses in pretensioned concrete members. What are the IS code provisions regarding bond stress and transmission length?   10M

OR

14. B). A prestressed concrete beam 250 mm wide and 650 mm deep is subjected to an effective prestressing force of 1360 kN along the longitudinal centroidal axis. The cables may be assumed to be symmetrically placed over mild steel anchor plate in an area 150 mm x 350 mm. Design the end block. Take cube strength of concrete at transfer f_{ci}=30 N/mm², Characteristic strength of concrete f_{ck}= 30 N/mm². Assume initial prestressing force = 1.2 times the effective prestressing force.   10M

15. A). Explain the difference between propped and unpropped composite construction with examples and stress distribution diagrams.   10M

OR

15. B). A prestressed concrete beam has a symmetrical I - section with overall depth 320mm. Top and bottom flange width = 160mm. The flange thickness = 70mm. The web is 50mm in thickness and the span 6m. It is prestressed with 182kN at a constant eccentricity of 105mm. Assume a loss of 15% in prestress. Compute the deflection due to   10M
a) Prestress + self weight
b) Prestress + self weight + Live load of 15kN/m.
E_c = 38kN/mm².

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Examination	:	B.Tech VI Semester Regular Examinations June-2025
Course Name	:	Ground Improvement Techniques
Course Code	:	A401407
Branch	:	Civil Engineering
Date & Session	:	01-07-2025 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 ground improvement.	1 M
2.	List out the various soil deposits found in India.	1 M
3.	Write a brief outline on deep compaction technique.	1 M
4.	Define vibrocompaction.	1 M
5.	State vertical drains.	1 M
6.	List out the objectives of hydraulic modification.	1 M
7.	Define grouting.	1 M
8.	Give a brief outline on Bituminous stabilization.	1 M
9.	Sate soil reinforcement.	1 M
10.	List out the applications of rock bolting.	1 M

PART-B
Answer the following. Each question carries TEN Marks.

5x10=50M

11.A).	Describe the factors influencing the selection of ground improvement techniques?	10M

OR

11. B).	Describe any two laboratories test to characterize the problematic soil.	10M
12. A).	Explain the following terms: 　　i)　Compaction Piles. 　　ii)　Dynamic Tamping	10M

OR

12. B).	Describe about the mechanism and effect of mechanical modification in poor soil.	10M
13. A).	When is pre-loading adopted as a ground improvement technique?	10M

OR

13. B).	Explain in detail with a neat sketch the method of dewatering using sumps and ditches stating its advantages and disadvantages.	10M
14. A).	Describe in detail about the various methods of grouting with neat sketches.	10M

OR

14. B).	Write a detailed note on 　　i)　cement stabilization. 　　ii)　Flyash Stabilization	10M
15. A).	Geosynthetics can be used as soil reinforcement – Justify in detail with supporting sketches.	10M

OR

15. B).	Describe in detail about soil nailing and explain when is it adopted.	10M

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