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5E1740

Roll No. _____ [Total No. of Pages : 2

5E1740

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE3-01 Construction Technology and Equipments

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. State any two fundamental principles of engineering economy.
2. List any three common causes of accidents in construction projects.
3. Why is construction planning considered essential for successful project execution?
4. State one major application of cranes and one major application of hoes in construction.
5. What is job layout in construction, and how does inspection contribute to quality control?
6. Write two safety measures for storage and handling of building materials.
7. Differentiate between depreciation and depletion with one example each.
8. Differentiate between a power shovel and a dragline in terms of operation and use.
9. State two main objectives and two key functions of materials management in construction projects.
10. Brief the sum of years Digits Method for calculation of Depreciation.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. What is a LTI in terms of safety? Also explain the importance of Near-miss reporting and elements of a near-miss report.
2. Explain the significance of the break-even point in engineering economy and how it helps in decision-making?
3. How are accidents classified in construction? Also, write difference between Direct Costs and Indirect Costs in calculation of cost of an accident.
4. What is the primary function of a bulldozer in earthwork? What is the purpose of pile driving equipment and where it is commonly used?
5. A company had 4 lost time injuries in a year. And the employees worked a total of 8,00,000 hours. Find the Frequency Rate (FR).
6. Name the main stages in a construction project and state the purpose of preparing a construction schedule.
7. What are the essential components of a safety programme in construction, and name two types of personal protective equipment.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. A contractor needs to choose a location for a concrete batch plant along a straight road between two work sites: site 'A' and site 'B'. Site A is at 0 km, site B is at 13 km. Transport cost per cubic meter per km = Rs. 6/-. Total concrete requirement at site A = 1300 m^3, site B = 900 m^3. Plant installation cost is fixed = Rs. 20,000/- (independent of location). Find the plat location ('X' km from site A) that minimizes total cost.
2. What are the major safety lacunae in the Indian construction industry, and state one fire safety provision as per the National Building Code (NBC).
3. Name two types of hauling equipments and mention in detail one tunnelling method involving drilling and blasting.
4. List any three major construction resources and explain the role of the construction team in detail.
5. Explain in detail "minimum cost point analysis". And also brief why it is important in evaluating the life cycle cost of an engineering project?

5E1741

Roll No. _____ [Total No. of Pages : 3

5E1741

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE4-02 Structural Analysis - I

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Differentiate Static and Kinematic indeterminacy?
2. Describe the Maxwell's Reciprocal theorem with the statements.
3. Calculate static and kinematic indeterminacy of given Figure?

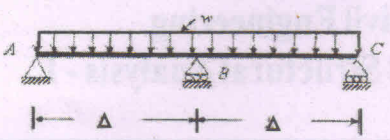
4. Explain the Distribution factor.
5. Define the D Alembert's principle.
6. Discuss the releases in structures.
7. Write down the basic elements of vibratory system.
8. Differentiate the damped and forced vibration?
9. Define the term "Angular oscillation".
10. List the characteristics of simple harmonic motion.

PART - B

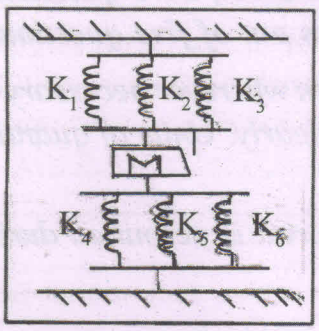
(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Determine the support reactions of the continuous beam ABC as shown in Fig. 2 using area moment method?



2. Derive the equation of "addition of harmonic motion".
3. Calculate the equivalent stiffness of spring mass system shown in fig. given below. Also find out the mass supported by the spring. When the system has natural frequency of vibration is 1 Hz, where spring constant K1 = K6 = 1000 N/m, K2 = K3 = 2000 N/m, K4 = 1500 N/m and K5 = 500 N/m.



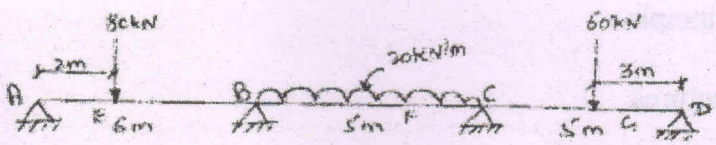
4. Define the stiffness of springs for series and parallel connections.
5. Derive the differential equation for free vibration of undamped single degree of freedom systems. Also give the solution of the differential equation.
6. Define the characteristics of Simple Harmonic Motion.
7. Describe the Mathematical model vibratory system.

PART - C

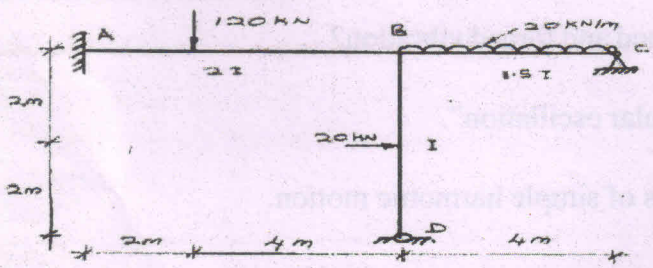
(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

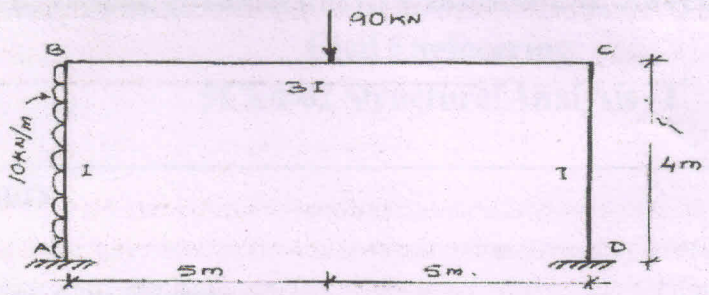
1. Analyse the beam as in Fig. 3 by using three-moment theorem when support B sinks by 5mm and I = 9300 cm^4; E = 2.1 × 10^5 N/mm^2 throughout the span.



2. Analyze the simple frame shown in Fig. given below. Draw the bending moment diagram by using moment distribution method.

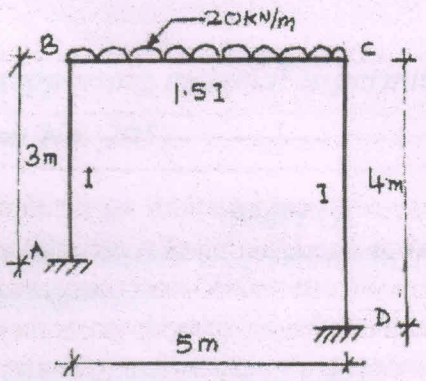


3. Analyze the portal frame subjected to loads as shown fig. given below. Draw bending moment diagram and deflected shape by using slope deflection method.



4. Analyze the portal frame subjected to loads as shown in question no. 3. Draw bending moment diagram by using moment distribution method.

5. Analyse the portal frame ABCD given below. Support A and D both are fixed. Span BC is loaded as per given figure. Draw the BM diagram by using slope deflection method. Also sketch the deflected shape of the frame.



5E1742

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5E1742

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE4-03 Design of Concrete Structures

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A
(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Define the characteristics strength of concrete. (2)
2. Define the modular ratio. (2)
3. What is the working stress design philosophy? (2)
4. What is meant by "Limit State of Collapse in Flexure"? (2)
5. Distinguish between one-way and two-way slabs. (2)
6. What is a Pu-Mu interaction Curve? (2)
7. Write the IS code provision for torsional moment. (2)
8. Define a short column. (2)
9. What is anchorage length? (2)
10. List two advantage of LSM over WSM. (2)

PART - B
(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Discuss the IS: 456-2000 provisions for design of beam subjected to combined bending, shear and torsion. (5)

2. Explain the design principles of isolated column footings and combined footings with sketches. (5)

3. With neat sketches, explain detailing rules for reinforcement in slabs. (5)

4. Write short note on:

   a) Minimum and maximum reinforcement requirement in beams. (2.5)

   b) Curtailment of reinforcement in beams. (2.5)

5. Discuss the difference between simply supported, continuous and cantilever slabs with their design consideration. (5)

6. A T-beam floor system has a flange thickness of 120 mm, flange width of 1200 mm, web width 250 mm and effective depth 550 mm. Determine the ultimate moment of resistance using M25 and Fe-415. (5)

7. Determine the ultimate moment of resistance of a rectangular beam of width 350 mm with 550 mm effective depth which is casted with M30 grade of concrete and reinforced with 4 numbers of 25 mm diameter bars of Fe-250 steel grade. (5)

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. A beam carries a uniformly distributed service load 35 kN/m including self weight on a simply supported span of 5m. The beam width is 300 mm and effective depth is 640 mm and is reinforced with 4-25ϕ Fe-415 bars. Determine the stress developed in concrete and steel at service load use M20 concrete. (10)

2. Design a doubly reinforced beam by limit state method of span 8m which is being subjected to a live load 30 kN/m. Overall depth of the beam is limited to 650mm. Use M20 concrete and Fe 415 steel. (10)

3. A RC rectangular beam of size 350mm × 450mm effective depth is subjected to a flexural moment of 25 kNm, a shear force of 55 kN and a torsional moment of 40 kNm using M20 concrete and Fe 415 steel design the reinforcement for the beam. (10)

4. Design a short column to carry a working, axial load of 450 kN. Use M20 concrete and Fe 250 steel. The unsupported length of the column is 4m and effective length factor is 0.85 use sp-16. (10)

5. Design a spread footing to carry an axial load of 1200 kN through a column of size 450mm × 450mm having 4-25ϕ bearing capacity of soil is.105 kN/m^2. Assume footing to be 1.25m below ground level and concrete of grade M25 and Fe 415 steel. (10)

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5E1743

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025

Civil Engineering

5CE4-04 Geotechnical Engineering

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions, from Part A, Five questions out of Seven questions from Part B and Three questions out of Five question from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

ALL questions are Compulsory. **(10×2=20)**

1. State Darcy's law of permeability.
2. Define void ratio and air void.
3. Define isobar diagram.
4. Differentiate active and passive earth pressure.
5. What are the different consistency limits for fine grained soils?
6. Distinguish compaction and consolidation.
7. What are the different types of slope failures?
8. Differentiate between normally consolidated and over consolidated soil.
9. State the significance of SPT-N value.
10. Discuss about disturbed and undisturbed soil samples.

PART - B
(Analytical/Problem solving questions)

Attempt any FIVE questions. **(5×4=20)**

1. A horizontal stratified soil deposit consists of three layers each uniform in itself. The permeabilities of these layers are 8×10^{-4} cm/s, 52×10^{-4} cm/s, and 6×10^{-4} cm/s and their thicknesses are 7,3 and 10 m respectively. Find the effective average permeability of the deposit in the horizontal and vertical directions.

2. Explain the Mohr-Coulomb failure criteria with a neat sketch.

3. What is quick sand condition? Derive the relation for critical hydraulic gradient.

4. Two identical specimens were tested in a triaxial apparatus. First specimen failed at a deviatoric stress of 770 kPa when the cell pressure was 200 kPa. second specimen failed at a deviatoric stress of 1370 kPa under a cell pressure of 400 kPa. Determine the value of c and angle of internal friction.

5. Derive the expression for the factor of safety of an infinite slope in a cohesionless soil.

6. A layer of soft clay is 6 m thick and lies under a newly constructed building. The weight of sand overlying the clayey layer produces a pressure of 260 kPa and the new construction increases the pressure by 100 kPa. If the compression index is 0.5, compute the settlement. Water content is 40% and specific gravity of grains is 2.65.

7. Derive the expression for the minimum depth of foundation using Rankine's theory.

PART - C
(Descriptive/Analytical/Problem solving/Design questions)

Attempt any THREE questions. **(3×10=30)**

1. Elaborate on the IS soil classification system and different symbols used. Also, draw the plasticity chart as per IS soil classification.

2. Obtain the differential equation defining the one-dimensional consolidation as given by Terzaghi, listing the various assumptions.

3. Describe the construction of Newmark's Influence chart with a neat sketch and explain how it is used to compute vertical stress beneath a point in a soil mass due to a uniformly loaded area.

4. A retaining wall 10 m high retains cohesionless soil with angle of internal friction 35 degrees. The top of the soil is level with the top of the wall and is horizontal. The unit weight of the top 4 m is 16 kN/m^3 and the rest is 20 kN/m^3. Find the magnitude per meter run and the point of application of the resultant thrust.

5. Explain the procedure to conduct Standard Penetration Test in detail. Discuss the corrections to be applied on the observed N-value.

5E1744

Roll No. _____ [Total No. of Pages : 2

5E1744

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE4-05 Water Resource Engineering

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Name two major benefits of irrigation.
2. What is meant by irrigation efficiency?
3. List different types of canals based on alignment.
4. What is the difference between distributary and minor canals?
5. What is the function of a diversion headwork in an irrigation system?
6. Differentiate between weir and barrage.
7. What is a silt excluder? Why is it required?
8. Distinguish between embankment dam and gravity dam.
9. What is a cross-drainage structure?
10. Define a shallow well.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Explain the necessity of irrigation in India. Discuss various types of irrigation systems along with their advantages and limitations.

2. Describe the types, functions and components of a gravity dam.
3. Explain the layout and functions of different components of a typical diversion headwork with neat sketches.
4. Define hydrology. Explain the hydrological cycle with a neat diagram.
5. Explain the factors affecting runoff in a catchment area.
6. Explain the types of wells used for irrigation. Discuss the suitability and advantages of tube wells over open wells.
7. What is meant by "regime channel"? Explain the characteristics and conditions of regime channel as per Lacey's theory.

PART - C

(Descriptive/Analytical/Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. Compare Kennedy's and Lacey's theories of canal design highlighting their assumptions, derivations and applicability to practical canal design.
2. Explain Bligh's Creep theory for seepage under hydraulic structures. Derive an expression for creep length and discuss the limitations of their method.
3. Discuss the modifications made by Khosla's to Bligh's Creep theory. Explain how Khosla's corrections help in safer design.
4. Describe Khosla's method of independent variables for seepage analysis under weirs and barrages.
5. Define unit hydrograph. State the assumptions of unit hydrograph theory. Derive the method for converting a storm hydrograph into a unit hydrograph and explain its applications.

5E1745

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5E1745

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Civil Engineering
5CE5-11 Air & Noise Pollution and Control (Elective-I)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. What are primary and secondary air pollutants? Give two examples of each.
2. List out major sources of air pollution in urban areas.
3. Differentiate between grab sampling and composite sampling in air quality monitoring.
4. Define Air Quality Index (AQI).
5. What is the function of a setting chamber in air pollution control?
6. What is indoor air pollution? Mention two common indoor air pollutants.
7. Define noise pollution and mention its major sources.
8. What is the meaning of dB (A)?
9. What are the permissible noise limits (day and night) in residential areas as per CPCB?
10. Mention two health impacts caused by high noise levels.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Discuss the major anthropogenic and natural sources of air pollution.
2. Explain the working principle of an electrostatic precipitator (ESP) and its application in power plants.
3. Define National Ambient Air Quality Standards (NAAQS). List out the permissible values of major pollutants included in it.
4. What is the purpose of air pollution indices like AQI? Describe how AQI is calculated and interpreted.
5. Describe any two engineering control methods used to reduce industrial noise pollution.
6. Explain the process of noise level measurement using sound level meter.
7. Describe the structure and function of a wet scrubber. Which pollutants are best removed by this device?

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. Describe the process and equipments used for ambient air quality monitoring.
2. Discuss the various engineering methods used to control industrial air pollution at the source.
3. What is the role and significance of absorption and adsorption processes in controlling gaseous emissions? Compare both techniques and their selection criteria.
4. Describe in detail the working, components and applications of a high-volume air sampler.
5. Discuss the interdisciplinary role of civil and environmental engineers in addressing air and noise pollution challenges in smart cities.

5E1748

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5E1748

B.Tech. V-Sem. (Main & Back) Examination, November/December - 2025
Civil Engineering
5CE5-14 Repair and Rehabilitation of Structures (Elective - II)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

ALL questions are compulsory. **(10×2=20)**

1. Differentiate between sorptivity and diffusion in concrete.
2. Explain chloride attack and its effect on reinforced concrete.
3. List two physical processes causing deterioration of concrete.
4. Explain any two water-proofing techniques for concrete.
5. Differentiate between the term repair and rehabilitation.
6. Define sulfate attack and mention its consequences.
7. What is a sacrificial anode, and how does it prevent corrosion?
8. List two protective coatings used in concrete structures.
9. Mention two modern materials used for repair of concrete.
10. Define corrosion inhibitors with examples.

PART - B

(Analytical/Problem solving questions)

Attempt any FIVE questions. **(5×4=20)**

1. Explain Carbonation of concrete, its mechanism, and preventive measures.

2. Explain in detail the abrasion and erosion process.

3. Explain preliminary and detailed investigations in damage assessment of structures.

4. Discuss the properties and selection criteria of epoxy, polyester, and resins.

5. Discuss grouting and jacketing techniques for structural rehabilitation.

6. Explain the rebound hammer and ultra-sonic pulse velocity techniques.

7. Discuss Alkali-Aggregate Reaction (AAR) and its effects on concrete.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any THREE questions. **(3×10=30)**

1. Explain the corrosion mechanism in steel reinforcement. Also discuss the various causes of corrosion.

2. Define the waterproofing of concrete structures? Also discuss in detail the various techniques of waterproofing.

3. Explain a case study of rehabilitation of masonry structures.

4. Write in detail about underwater repair techniques for concrete structures.

5. Describe various types and patterns of cracks in concrete and masonry structures with methods of prevention.

5E1344

Roll No. _____ [Total No. of Pages : 3]

5E1344

B.Tech. V-Sem. (Re Back) Examination, November/December - 2025
Civil Engg.
5CE4-04 Geotechnical Engineering

Time : 3 Hours **Maximum Marks : 120**
Min. Passing Marks:42

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are Compulsory. **(10×2=20)**

1. A Sample of fine-grained soil has liquid limit and plasticity index of 40% and 35% respectively. Classify the soil as per Indian Standards.
2. What us normally consolidated soil?
3. Define the term Permeability.
4. What do you mean by the term toughness of soil?
5. What is an isobar diagram?
6. What do you mean by the term shrinkage limit of soil?
7. Explain the terms 'Sensitivity' and 'activity' of clayey soils.
8. What are most common minerals in clay?
9. Explain weathering of soil.
10. Define effective stress.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×8=40)**

1. What is the quick sand condition? Define total stress, effective stress and pore water pressure?
2. A partially saturated sample from a borrow pit has a natural moisture content of 15% and bulk unit weight of 1.9 g/cc. The specific gravity of solids is 2.7 Determine the degree of saturation and void ratio.
3. What is quick sand condition? Derive the relation for critical hydraulic gradient, $i_{cr}=\frac{G-1}{1+e}$.
4. Find the intensity of vertical pressure at a point 4 m directly below a 20kN point load acting at a horizontal surface. What will be the vertical pressure 2 m horizontally away from the axis pf loading? Solve according to Boussinesq theory.
5. Derive relation for permeability for falling head method.
6. Derive an equation to express the bulk density of a soil mass in terms of its void ratio, water content, specific gravity, degree of saturation and density of water.
7. What is negative skin friction? What is its effect on the pile capacity?

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions. **(4×15=60)**

1. Describe Standard Proctor test and Modified proctor test.
2. A rectangular footing as size 1.8m× 3m and has to transmit a load of the column at a depth of 1.5m. Calculate the ultimate bearing capacity which the footing can carry using IS Code Method, if the water table is at the base of the footing and Angle of internal friction is 33°. γ=18.04 kn/m^3, α=10°,Nc=38.13,Nq=25.86, $N\gamma$=35.2 and C=8 kn/m^2
3. What is soil classification? Draw plasticity chart as per Indian Soil Classification Systems. Give explanation of different symbols used in the chart.
4. What are the assumptions made in the derivation of Terzaghi's bearing capacity theory? Sketch failure plane of Terzaghi's analysis with the description of all its zones. Differentiate between the general shear failure and local shear failure. How the bearing capacity in local shear is determined?

5. Distinguish between normally and over consolidated soils. In a consolidation test, the void ratio of the specimen which initially 1.068 under an effective pressure of 214 kN/m^2 changed to 0.994 when the pressure was increased to 429 kN/m^2, Calculate the coefficients of compressibility, compression index and coefficient of volume compressibility. Find the settlement of foundation resting on top of clay if the thickness of layer is 8m and the increase in pressure is 10kN/m^2.

5E1343

Roll No. _____ [Total No. of Pages : 3

5E1343

B.Tech. V-Sem. (Re Back) Examination, November/December - 2025
Civil Engg.
5CE4-03 Design of Concrete Structures

Time : 3 Hours **Maximum Marks : 120**
Min. Passing Marks:42

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART-A

(Answer should be given up to 25 words only)

All questions are Compulsory. **(10×2=20)**

1. Define the term "Characteristic Strength" in concrete design.
2. Define depth of Neutral Axis. Give formula to calculate depth of Neutral Axis.
3. What is the primary difference between working stress method and limit state method of design?
4. Discuss the requirement of doubly reinforced beam over singly reinforced beam.
5. What is meant by the term "development length" in reinforcement design?
6. Define "shear reinforcement" and give one example.
7. Differentiate between one way slab and two way slab.
8. What is the role of torsion in the design of concrete beams?
9. Differentiate between short columns and long columns in structural behavior.
10. Differentiate between Isolated column footing and combined footing.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×8=40)**

1. Using the working stress Method, design a singly reinforced rectangular beam section for flexure. Given: Length of beam = 5 m, applied moment = 20 kNm. Use M-20 concrete and Fe-415 steel.
2. Analyze a rectangular beam 300 mm wide and 550mm effective depth to determine the ultimate moment of resistance for the tension reinforcement of 4-16 mm dia. Bars using LSM. Consider M-20 concrete and Fe-415 steel.
3. Derive the expression for the deflection of a simply supported beam and explain the control of deflection as per codal provisions.
4. An RCC beam 250mm×500mm has a clear span of 5.5m. The beam has 2-20 mm dia. Bars going into the support. Factored shear force is 140kN. Check for development length if M-20 concrete and Fe-415 steel is used.
5. Discuss the design procedure for shear reinforcement in a beam.
6. Explain the design procedure for a beam subjected to torsion using codal provisions.
7. Design a short column using the Limit State Method for axial load of 1200 kN and 300mm×300 mm in size. Assume the column is reinforced with steel of grade Fe-415 and concrete of grade M-20.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions. **(4×15=60)**

1. Design a simply supported R.C. Slab for a room having inside dimension 3m×7m. The thickness of supporting wall is 300mm. When slab carries an imposed load of 3KN/m^2 as lime concrete on its top and a Live Load of 2KN/m^2. Use M-20 concrete and Fe-415 steel. Take unit weight of RCC 25kN/m^3.
2. Determine the factored moment of resistance of a beam 250mm×450mm. The beam is reinforced with 2-16 mm dia. Bars on compression side and 4-20 mm dia. Bars on tension side. The compression bars are placed at a distance of 40mm from top. Use M-20 concrete and Fe-415 steel.

3. A rectangular reinforced concrete beam is simply supported on two masonry walls 300mm thick and a clear span of 6m. The beam is carrying an imposed load of 15kN/m. Design the beam with all necessary checks by LSM. Use M-20 concrete and Fe-415 steel.

4. Explain the following:

   a) Limit state of serviceability

   b) Balanced, over-reinforced and under-reinforced beam

   c) Limit state of collapse in shear and bond.

5. A footing supports a square column of 450×450 mm width, having a service load of 850kN. Find out the size. Depth and reinforcement required in it using LSM, if the safe bearing capacity of soil is 200 kN/m^2. Use M-20 concrete and Fe-415 steel.

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B.Tech. V-Sem. (Re Back) Examination, November/December - 2025

PCC/PEC Civil Engg.

5CE4-02 Structural Analysis-I

Time : 2 Hours

Maximum Marks : 80

Min. Passing Marks : 28

Instructions to Candidates:

Attempt all Five questions from Part A, Four questions out of Six questions from Part B and Two questions out of Three questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are Compulsory. **(5×2=10)**

1. Define the term "Indeterminate Structure".
2. What do you mean by "Conjugate beam method" in structural analysis?
3. Define the terms:
   a) Carry over factor
   b) Distribution factor used in moment distribution method
4. State Maxwell's reciprocal theorem.
5. Explain Simple Harmonic Motion.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Four questions. **(4×10=40)**

1. Explain the concept of 'release's in structural members and its impact on indeterminacy.

2. A beam ABC of length 2L rests on three supports equally spaced and is loaded with UDL 'w' per unit length throughout the length of the beam. Plot the BM and SF diagrams using three moments theorem.
3. Discuss the Betti's Theorem and explain its application in structural analysis.
4. Using the slope-Deflection Method, analyze a continuous beam and calculate the reactions and moments.
5. Explain the procedure for analyzing statically indeterminate structures using the Moment Distribution Method. Apply it to a portal frame with no sway.
6. Derive the equation of motion for an undamped free vibration of a single degree-of-freedom system (SDOF) and solve for its frequency and period.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Two questions. **(2×15=30)**

1. A Cantilever beam of length 6 m carries a point load of 20 kN at its free end. Using the Conjugate Beam Method, determine the deflection and slope at the free end.
2. Analyze the fixed beam AB of span 6 m carrying a UDL of 10 kN/m over the entire span using the area moment method. Draw BMD and SFD.
3. Using slope deflection method solve the structure shown in Fig. Below. Plot the bending moment diagram.