FIFTH

Reg. No. | | | | | | | | | | | |

**Question Paper Code : 57171**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 6501 – STRUCTURAL ANALYSIS – I**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. Distinguish between static indeterminacy and kinematic indeterminacy.

2. Brief the method of consistent deformation for the analysis of a propped cantilever.

3. State the position of loading for maximum bending moment at a point in a simply supported beam when it is subjected to a series of moving point loads.

4. Draw influence line for shearing force at any point in a simply supported beam using Muller Breslau's principle.

5. Determine the value of horizontal thrust at the supports of a three hinged symmetrical parabolic arch having 15 m span and 3 m central rise with a point load 10 kN at a section 5 m from the left support.

6. What is meant by "reaction locus" of a two hinged arch ?

7. State the assumptions made in slope deflection method for the analysis of indeterminate structures.

8. Write the support reactions induced in a fixed beam when one of its supports sinks.

9. What do you understand by the term distribution factor ?

10. What are the conditions in which a frame is subjected to sway ?

**PART – B (15 × 16 = 80 Marks)**

11. (a) A fixed beam of 6 m carries a uniformly distributed load of 4 kN/m over the left half span. Analyze the beam using energy method and draw the bending moment diagram.

**OR**

(b) A continuous beam ABC of uniform section is fixed at A and supported at B and C. The spans AB and BC are 4 m and 6 m respectively. The span BC carries a uniformly distributed load of 6 kN/m and the span AB carries a central concentrated load of 10 kN. Analyze the beam by consistent deformation method and draw the shear force and bending moment diagrams.

12. (a) A train of loads as shown in Fig. Q.12 (a) crosses a simply supported beam of 24 m span from left to right. Using influence line determine the maximum bending moment at left one - third span point and also the absolute maximum bending moment in the beam.

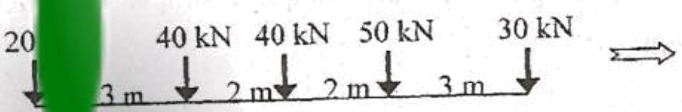



Fig.Q 12 (a)

**OR**

(b) A continuous beam ABC is simply resting on supports A and C, and continuous over the support B. The span AB is 6 m and the span BC is 8 m. Draw the influence line diagram for moment at B. Assume Flexural rigidity is constant throughout and calculate the influence line ordinates at 2 m intervals.

13. (a) A uniformly distributed load of 6 kN/m covers the left half span of a three hinged symmetrical parabolic arch of span 24 m and central rise 4 m. Determine the horizontal thrust and also the bending moment, shearing force and normal thrust at the loaded quarter span.

**OR**

(b) A symmetrical two hinged parabolic arch has a span of 50 m and central rise 5 m. It carries a concentrated vertical load of 20 kN at 10 m from left support in addition to a vertical load of 30 kN at the crown. Draw the bending moment diagram for the arch and also determine the radial shear and normal thrust at 12.5 m from the left support.

14. (a) A continuous beam ABC is fixed at A and simply supported at B and C. The span AB is 5 m and carries a concentrated load of 30 kN midway between the span BC is 8 m and carries a uniformly distributed load of 12 kN/m. Take the flexural rigidity for portion AB as EI and that for portion BC as 2EI. Analyze the beam by slope deflection method and draw the shearing force and bending moment diagrams.

**OR**

(b) Analyse the frame shown in Fig. Q. 14 (b) by slope deflection method and draw the bending moment diagram.

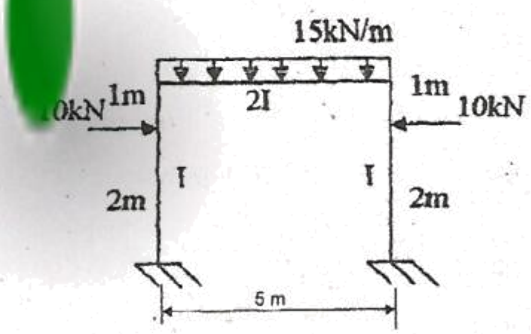
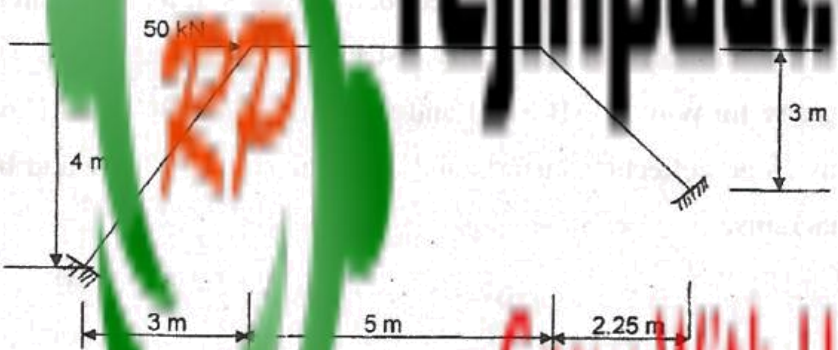



**Fig. Q. 14(b)**

15. (a) A continuous beam ABCDE 18 m long is simply supported at A and also at B, C and D at 4 m, 10 m and 16 m respectively from the left end A and the portion DE being overhanging over 2 m. The span AB carries a point load of 40 kN at its mid-span, the span BC is subjected to a uniformly distributed load of 12 kN/m, the span CD carries a point load of 60 kN at 2 m from C and the free end (E) carries a point load of 10 kN. Analyse the beam by moment distribution method and draw the shearing force and bending moment diagrams. Consider the flexural rigidity of the portions AB, BC and CD, DE as EI, 3EI and 2EI, 2EI respectively.

**OR**

(b) Analyse the portal frame shown in Fig.Q.15 (b) by moment distribution method and draw the bending moment diagram. Assume flexural rigidity is constant for all the members.



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**Question Paper Code : 57173**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 6502 – FOUNDATION ENGINEERING**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART A (10 × 2 = 20 Marks)**

1. Differentiate disturbed and undisturbed samples.
2. What are the limitations of Static Cone Penetration test ?
3. What are the modes of failure of shallow foundations ?
4. List various methods of minimising total and differential settlement.
5. When does strap footing preferred ?
6. Draw the contact pressure distribution diagram below rigid footing resting on clay and sand.
7. State Feld's rule for determining group capacity of pile groups.
8. What is under reamed pile ? When is it preferred ?
9. Draw the variation of lateral earth pressure with wall movement.
10. Draw the force polygon for lateral active earth pressure on wall retaining cohesionless soil according to Coulomb's wedge theory.

## PART – B (5 × 16 = 80 Marks)

11. (a) (i) Why SPT 'N' values recorded in sand at different depths are corrected for overburden and submergence ? How these corrections are applied ? (8)

(ii) Explain wash boring method of advancing bore hole. (8)

**OR**

(b) (i) Explain arrangements and operation of stationary piston sampler. State its advantages over other samplers. (8)

(ii) Explain all the salient features of bore log report. (8)

12. (a) (i) Determine the ultimate [illegible] capacity of a strip footing .5 m wide, with its base at [illegible] resting on a dry sand stratum. Take $\gamma = 17$ kN/m$^3$; $\phi$ = [illegible]. Use IS code method. For $\phi$ = [illegible], $N_q$ = 48.9 and $N_\gamma$ = 56.2. (8)

(ii) The following [illegible] was obtained from a plate load test carried out on a [illegible]0 cm square [illegible]ate at a depth of 2 m below ground surface on a sandy [illegible]il which ex[illegible]ds upto a large depth. Determine the settlement of a foundation 3.[illegible] m × 3.0 m carrying a load of 1100 kN and located at a [illegible]epth of [illegible] m [illegible]elow ground surface. (8)

| L[illegible] [illegible]tensity, kN/m$^2$ | 50 | 100 | 150 | 200 | 250 | 300 | 350 | 400 |
|---|---|---|---|---|---|---|---|---|
| S[illegible] [illegible]nent, mm | 2.0 | 4.0 | 7.5 | 11.0 | 16.3 | 23.5 | 34.0 | 45.0 |

**OR**

(b) (i) A strip footing of 1.5 m wide, resting on a sand stratum with its base at a depth of 1m. The properties of the sand are : $\gamma$ = 17 kN/m$^3$, $\gamma_{sat}$ = 20 kN/m$^3$, $\phi$ = 38° and c′ = 0. Determine the ultimate bearing capacity of the footing using Terzaghi's theory if the ground water table is located at a depth of 0.5m below the base of the footing. For $\phi$ = 38°, assuming general shear failure $N_q$ = 60 and $N_\gamma$ = 75. (8)

(ii) Find the net allowable load on a square footing of 2.5 m × 2.5 m. The depth of foundation is 2 m and the tolerable settlement is 40 mm. The soil is sandy with Standard Penetration Number of 12. Take a factor of safety of 3. The water table is very deep. **(8)**

13. (a) (i) A trapezoidal footing is to be provided to support two square columns of 30 cm and 60 cm sides respectively. Columns are 6 m apart and the safe bearing capacity of the soil is 400 kN/m$^2$. The bigger column carries 5000 kN and the smaller 3000 kN. Design a suitable size of the footing so that it does not extend beyond the faces of the columns. **(10)**

(ii) Explain with neat sketch different types of shallow foundations. **(6)**

OR

(b) (i) Explain the conventional method of proportioning of rectangular combined footing. **(10)**

(ii) Proportion a rectangular combined footing for two columns 5 m apart. The exterior column of size 0.3 m × 0.3 m carries a load of 600 kN and interior column of size 0.4 m × 0.4 m carries a load of 900 kN. The allowable soil pressure is 100 kN/m$^2$. **(6)**

14. (a) (i) Classify pile foundation based on (1) method of installation, (2) load transfer mechanism. **(6)**

(ii) It is proposed to provide pile foundation for a heavy column; the pile group consisting of 4 piles, placed at 2 m center to center, forming a square pattern. The underground soil is clay, having Cu at surface as 60 kN/m$^2$ and at depth 10 m, as 100 kN/m$^2$. Compute the allowable column load on the pile cap, if the piles are circular having diameters 0.5 m each and length as 10 m. **(10)**

**OR**

(b) (i) A group of nine piles, 12 m long and 250 mm in diameter, is to be arranged in a square form in a clay soil with an average unconfined compressive strength of 60 kN/m$^2$. Work out the center to center spacing of the piles for a group efficiency factor of 1. Neglect bearing at the tip of the piles. **(10)**

(ii) Discuss the method of obtaining ultimate load and also allowable load on a single pile from pile load test. **(6)**

15. (a) Explain Culmann's graphical method for determining active lateral earth pressure on rigid retaining wall. **(16)**

OR

(b) Explain Rankine's theory for active and passive earth pressure on rigid wall in cohesionless soil. Consider both presence and absence of surcharge for active case. **(16)**

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**Question Paper Code : 57175**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 6503 – ENVIRONMENTAL ENGINEERING – I**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART – A (10 × 2 = 20 Marks)**

1. What is design period ? List any two factors influence it.
2. State the assumptions made in an incremental increase method to forecast population.
3. Draw any tow line diagrams of joints in pipe lines ?
4. How will you calculate total head in the design of pumps for water supply schemes ?
5. Define break point chlorination.
6. Differentiate disinfection and sterilization.
7. How do you remove iron and manganese from water ?
8. What do you meant by water softening ?
9. Mention the role of computer application in water distributing systems.
10. Write the various methods to find leakage in pipelines.

## PART – B (5 × 16 = 80 Marks)

11. (a) Explain the laboratory procedure to determine chlorides, turbidity, sulphates and odour. (16)

OR

(b) (i) Explain the factors affecting the per capita demand of a town. (8)

(ii) Derive an expression for determining the discharge from an unconfined aquifer under steady flow conditions. (8)

12. (a) (i) Explain the functioning of a jet pump with neat sketch. (8)

(ii) Discuss the factors influencing the selection of a pump. (8)

OR

(b) What is intake structure? Explain with neat sketches, the various type of intake structures based on sources. (16)

13. (a) Find the area of rapid sand filter required for a town having a population of 80,000 with an average rate of demand 180 lpcd. Assume suitable data for design. Draw the cross section of the designed filter. (16)

OR

(b) (i) Explain the sedimentation process used in water treatment plant. (8)

(ii) Draw the longitudinal section of a sedimentation tank indicting the various zones. (8)

14. (a) Write short notes on : (i) Desalination process, (ii) Membrane process. (8 + 8)

OR

(b) (i) Explain the activated carbon treatments and pollutants removed and advantages of the process. (8)

(ii) Explain the techniques involved in de-fluoridization. (8)

15. (a) (i) Explain the Hardy-Cross method of distribution network analysis. (8)

(ii) Write short notes on the detection and prevention of wastage of water. (8)

OR

(b) Discuss the various possible water distribution arrangements in multi-storaged buildings. (16)

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**Question Paper Code : 57177**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 2303 HIGHWAY ENGINEERING**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**(Relevant IRC Codes are allowed)**

**Answer ALL questions.**

**PART A (10 × 2 = 20 Marks)**

1. Write short notes on Highway Research Board.
2. What are Shoulders ?
3. What are the elements involved in Highway Geometric design ?
4. What is meant by extra widening at curves ?
5. What are the factors affecting Pavement Design ?
6. Define Critical load positions.
7. What is significance of static immersion test ?
8. Define flakiness index.
9. Differentiate delamination and depression.
10. What are the causes of cracks ?

## PART – B (5 × 16 = 80 Marks)

11. (a) Explain the Bombay road congress 1961.

**OR**

(b) Explain in detail the reconnaissance survey for Highway location in rural area.

12. (a) What are the factors affecting Sight distance ?

**OR**

(b) The design sp of a highway is 80 kmph. There is a horizontal curve of radius 200 m on this . If maximum super elevation of 1 in 15 is not to be exceeded calculate the mum allowable speed on the curve. Also determine the extra widenin , re nd length of the spiral transition curve using the following data. ng of the heel base=6.1 m, Pavement width = 7.2 m and number of lanes 2. ate of intr duction of super elevation is 1 in 2 0.

13. (a) D the paveme for co st ct o of a new by-pass with the f ll wing ata:

1. Two lane carr ge wa
2. Initial traffic i the y ar of completio of construction 4 CVPD (sum of both directi s)
3. Traffic g owth = 7.5 %
4. Design life =1 rs
5. Vehicle dam factor based on axle load survey = 2.5 standard axle per commercial vehicle
6. Design CB R subgrade soil = 4%.

**O**

(b) Explai ign of joints.

14. (a) What are Desirable properties of aggregates ?

**OR**

(b) Explain the Ductility test and Softening point test.

15. (a) Explain in detail the possible causes and remedial measures for joint failure.

**OR**

(b) Explain the possible causes and remedial measures for join spalling.

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**Question Paper Code : 57179**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 6505 – DESIGN OF REINFORCED CONCRETE ELEMENTS**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART A – (10 × 2 = 20 Marks)**

1. Write any two assumptions are made in elastic theory method.
2. What is the formula used to find the critical neutral axis in working stress method ?
3. Write any two guidelines to select the cross sectional dimensions of reinforced concrete beams.
4. Enumerate the advantages of flanged beams.
5. What is the importance of anchorage value of bends.
6. Define shear friction.
7. Write any two salient assumptions are made in the limit state design of columns.
8. What are the important limitations of slender columns ?
9. Why the dowel bars are provided in footing ?
10. What is the necessity of providing combined footings ?

**PART – B (5 × 16 = 80 Marks)**

11. (a) A Reinforced concrete rectangular beam is supported on two walls 750 mm thick, spaced at a clear distance of 6 m. The beam carries a super imposed load of 30 kN/m. Design the beam in working stress method. M20 grade concrete Fe 250 bars. Draw reinforcement details. **(16)**

**OR**

(b) Design one way slab simply supported slab on a clear span of 4 m, the width of the supports being 500 mm. The dead load on the slab may be taken as 1000 N/ $m^2$ excluding its self weight. The live load on the slab is 2000 N/$m^2$. Use M 20 grade concrete and Fe 415 grade steel. Adopt working stress method. **(16)**

12. (a) A T-beam slab floor of an office comprises of a slab 150 mm thick spanning between ribs spaced at 2 m centres. The effective span of the beam is 8 m. Live load on floor is 4 kN/$m^2$. Using M 20 grade and Fe 415 HYSD bars. Design one of the intermediate T beams. Use limit state method. **(16)**

**OR**

(b) Design a two way slab for an office floor size 3.5 m × 4.5 m with discontinuous and simply supported edges on all the sides with the corners prevented from lifting and supporting a service live load of 4.4 kN/$m^2$. Adopt M 20 grade and Fe 415 HYSD bars. **(16)**

13. (a) (i) Explain the terms Diagonal tension and bond stress with reference to R.C beams. (6)

(ii) Obtain an expression for calculation of bond stress and shear stress in case of reinforced concrete beams of rectangular section with tensile steel of diameter (Φ). Also obtain relationship between bond stress and shear stress. (10)

**OR**

(b) A beam of rectangular section is reinforced with 6 nos of 18 mm diameter bars in tension and supported on an effective span of 5 m, the beam being 300 mm wide and 700 mm deep. The beam carries a uniformly distributed load of 42 kN/m. Design the shear reinforcement considering 8 mm bars for shear. Assume $\sigma_{sv}$ = 230 N/mm², $\tau_c$ = 0.30 N/mm² and $\tau_{c,max}$ = 4.5 N/mm². (16)

14. (a) Design the reinforcement for a circular column of diameter 300 mm to support a service axial load of 800 kN. The column has an unsupported length of 3 m and is braced against side sway. The column is reinforced with helical ties. The materials to be used are M 25 grade of concrete and HYSD steel bars of grade Fe 415. (16)

**OR**

(b) Design the reinforcements in a short column 400 mm × 400 mm at the corner of a multistoreyed building to support an axial factored load of 1500 kN, together with biaxial moments of 50 kN.m acting in perpendicular planes. Adopt M 20 grade of concrete and steel grade Fe415 HYSD bars. (16)

15. (a) Design a reinforced concrete footing for a rectangular column of section 300 mm × 500 mm supporting an axial factored load of 1500 kN The safe bearing capacity of the soil at site is 185 kN/m$^2$. Adopt M 20 grade of concrete and HYSD steel bars of grade Fe 415. **(16)**

**OR**

(b) Design a combined column footing with a strap beam for two reinforced concrete columns mm × 300 mm size spaced 4 m apart and each supporting a factored axial lo f 750 kN. Assume the ultimate bearing capacity of soil at site as 225 kN/m pt M 20 grade of concrete and steel grade Fe415 HYSD bars. **(16)**

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**Question Paper Code : 57181**

**B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016**

**Fifth Semester**

**Civil Engineering**

**CE 6506 – CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICE**

**(Regulations 2013)**

**Time : Three Hours** **Maximum : 100 Marks**

**Answer ALL questions.**

**PART A – (10 × 2 = 20 Marks)**

1. What is the use of accelerators in concrete ?
2. Mention any four Destructive methods of testing concrete.
3. What is the purpose of providing Damp proof courses ?
4. Define Slip form.
5. What is meant by coffer dam ?
6. What is meant by pipe jacking ?
7. Write a note on offshore platform.
8. Define articulated structures.
9. Name the equipments used for earth moving operations.
10. What is meant by dredging ?

**PART – B (5 × 16 = 80 Marks)**

11. (a) What are the factors to be considered for mix design ? Explain the step by step procedure for IS method.

**OR**

(b) Explain any two tests for testing of fresh concrete.

12. (a) Describe the differen es of bonds in brick masonry with sketches.

**OR**

(b) What is scaff di on its various components and types.

13. (a) Describ procedure in olved i under water construction of diaphragm wall and bas t.

**OR**

(b) What is de atering ? And l y explain the vari us dewatering techniques.

14. (a) Explain the g neral requir ts in launching girders.

**OR**

(b) Explain ab t the up rt structures required for heavy equipments and conveyors.

15. (a) Explain the va s equipments for pile driving.

**OR**

(b) Mention the various types of earthwork equipment. Mention their uses.

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