CBCS SCHEME

USN | | | | | | | | | | |

15CV/CT51

Fifth Semester B.E. Degree Examination, June/July 2019
Design of RC Structural Elements

Time: 3 hrs. Max. Marks: 80

Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.
2. Use of IS456-2000 and SP-16 is permitted.
3. Assume any missing data suitably.

Module-1

1 a. Explain the principles of limit state design. **(06 Marks)**

b. Enlist the reasons for adopting partial safety factors for loads and material strength. **(05 Marks)**

c. Derive from the fundamentals the expression for the area of stress block $0.36 f_{ck} x_u$. **(05 Marks)**

OR

2 a. Explain short term deflection and long term deflection. **(06 Marks)**

b. A simply supported RCC beam of size 300mm × 600mm carries a Udl live load of 25 kN/m and superimposed load [Dead load] 12 kN/m over an effective span of 5m. It is reinforced with 4 - # 16mm diameter bars. The effective cover is 50mm. Calculate the short term deflection and long term deflection of beam, if i) Ultimate shrinkage coefficient = 0.0003, ii) Creep co-efficient = 1.6, concrete grade M20, and steel Fe415 are used. **(10 Marks)**

Module-2

3 a. A singly reinforced concrete beam of 250mm × 450mm deep upto the centre of reinforcement is reinforced with 3-#16 at an effective cover of 50mm, effective span 6m, M20 concrete and Fe415 steel. Determine the central point load that can be supported in addition to the self weight. **(10 Marks)**

b. Determine the moment of resistance of a T-beam for the following data:
Breadth of the flange =740mm,
Effective depth = 400mm,
Breadth of web = 240mm,
Area of steel = 5 – 20 and
Depth of flange = 110mm,
Adopt M20 grade concrete and Fe415 steel. **(06 Marks)**

OR

4 a. A doubly reinforced beam section is 250mm wide and 450mm deep upto the centre of the tensile reinforcement. It is reinforced with 2-ϕ16 as compression reinforcement at an effective cover of 50mm and 4-ϕ25 as tensile steel, using M20 concrete and Fe250 steel, calculate the ultimate moment of resistance of the beam section. **(09 Marks)**

b. A Tee beam has the following data:
i) C/C spacing of beams = 3.20mt,
ii) Simply supported efficiency span of (simply) beam ⇒ 8m
iii) Depth of slab = 150mm
iv) Size of web of beam = 300mm × 500mm.
Calculate the balanced moment of resistance. **(07 Marks)**

Module-3

5 Design a reinforced concrete beam of rectangular cross-section using the following data: Effective span = 5m, width of beam = 250mm, overall depth = 500mm, service load including dead load and live load = 40kN/m, tension cover = 50mm. Adopt M20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. **(16 Marks)**

OR

6 a. List the circumstance under which doubly reinforced beam are recommended. **(04 Marks)**

b. A rectangular beam 230mm × 550mm deep is subjected to a sagging BM of 40 kNm, shear force of 30kN and twisting moment of 11.5 kNm at a given section. Design the reinforcement if M20 grade concrete and Fe415 steel are used. Sketch the details. **(12 Marks)**

Module-4

7 Design a R.C.C. slab for an office floor 4.5m × 5.5m with all four edges discontinuous and corners held down. The live load on the slab is 3kN/m^2. Assume floor finish as 0.6 kN/m^2 and ceiling finish as 0.4 kN/m^2. Use M20 concrete and Fe415 steel. Sketch the reinforcement details. **(16 Marks)**

OR

8 Design a Dog legged Stair for an office building in a room measuring 2.8m × 5.8m clear vertical distance between the floors is 3.6m. The width of flight is to be 1.25m. Assume live load of 3kN/m^2. Use M-20 concrete and Fe-415 grade steel. Assume that the stairs are supported on 230mm at the outer edges of landing stairs. Sketch the reinforcement details. **(16 Marks)**

Module-5

9 a. Design the reinforcement for a square column of size 450mm × 450mm to support a service load of 1500kN. Use M20 concrete and Fe-415 steel. **(08 Marks)**

b. A column size of 300mm × 400mm has an effective length of 3.6m and is subjected to P_u = 1100kN and M_u = 150kNm, about the major axis. Assuming the bars on two sides, design the column using M25 concrete and Fe415 steel. **(08 Marks)**

OR

10 Design an isolated footing of uniform thickness of a RC column, bearing a vertical load of 600kN and having a base of size 500mm × 500mm. The safe bearing capacity of the soil may be taken as 120kN/m^2. Use M-20 grade concrete and Fe-415 grade steel. Sketch the reinforcement details. **(16 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV52

Fifth Semester B.E. Degree Examination, June/July 2019
Analysis of Indeterminate Structures

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Analyse the continuous beam shown in Fig.Q1(a) by slope deflection method. Draw bending moment diagram. EI is constant. **(06 Marks)**

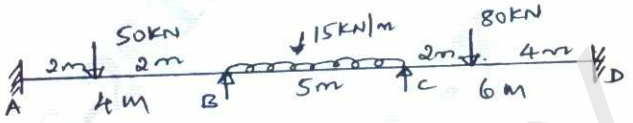

Fig.Q1(a)

b. Analyse the portal frame shown in Fig.Q1(b) by slope deflection method. Draw bending moment diagram. **(10 Marks)**

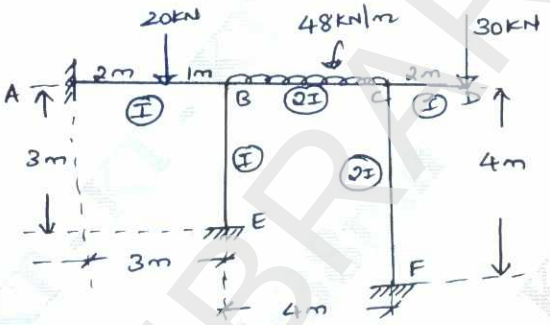

Fig.Q1(b)

OR

2 a. Analyse the continuous beam shown in Fig.Q2(a) by slope deflection method. Support 'B' sinks by 3 mm. Take EI = 3000 kN-m^2. Draw bending moment diagram. **(06 Marks)**

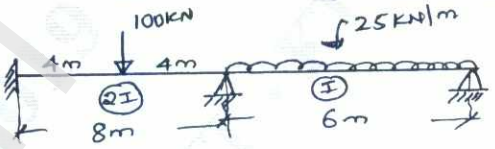

Fig.Q2(a)

b. Analyse the portal frame shown in the Fig.Q2(b) by slope deflection method. Draw bending moment diagram. **(10 Marks)**

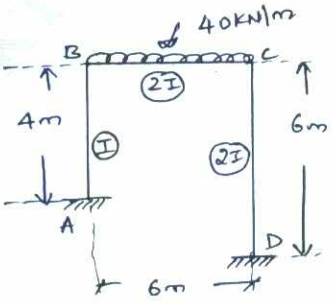

Fig.Q2(b)

Module-2

3 a. Analyse the continuous beam using moment distribution method. Draw bending moment and shear force diagram. Refer Fig.Q3(a). **(06 Marks)**

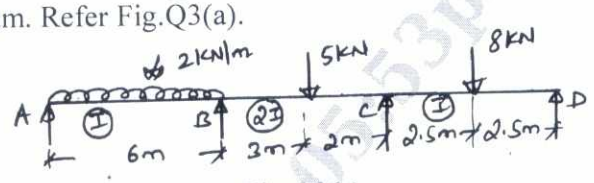

Fig.Q3(a)

b. Analyse the portal frame shown in Fig.Q3(b) using moment distribution method. Draw bending moment diagram. Take EIS = 20 kN-m^3. **(10 Marks)**

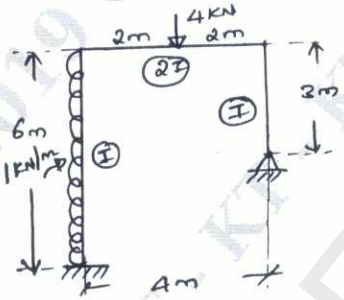

Fig.Q3(b)

OR

4 a. A horizontal beam is loaded as shown in Fig.Q4(a). It support 'A' sinks by 10 mm and B by 30 mm and C by 20 mm. Determine the end moments in the beam. Given I = 2.4×10^6 mm^4 and E = 2×10^5 N/mm^2. **(08 Marks)**

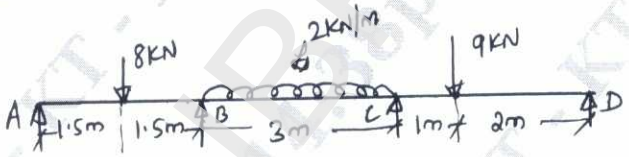

Fig.Q4(a)

b. Analyse the portal frame shown in Fig.Q4(b) using moment distribution method. Draw bending moment. **(08 Marks)**

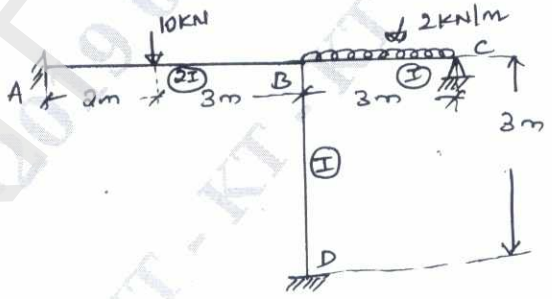

Fig.Q4(b)

Module-3

5 a. Analyse the continuous beam shown in Fig.Q5(a) using Kani's method. Draw bending moment diagram. **(08 Marks)**

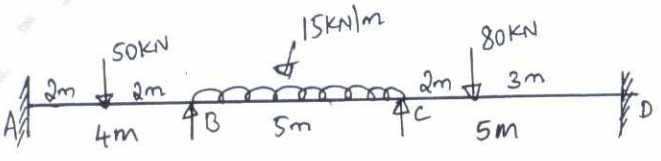

Fig.Q5(a)

b. Analyse the frame shown in Fig.Q5(b) using Kani's method. Draw bending moment diagram. **(08 Marks)**

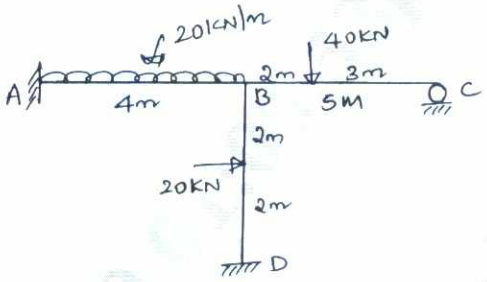

Fig.Q5(b)

OR

6 Analyse the frame shown in Fig.Q6 by Kani's method. Draw bending moment diagram.

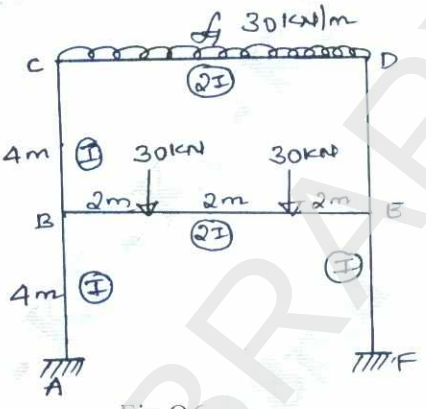

Fig.Q6 **(16 Marks)**

Module-4

7 a. Analyse the beam shown in Fig.Q7(a) by flexibility method and draw bending moment diagram. **(08 Marks)**

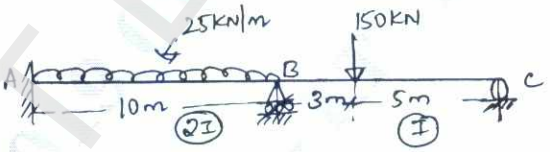

Fig.Q7(a)

b. Analyse the frame shown in Fig.Q7(b) by flexibility method and draw bending moment diagram. **(08 Marks)**

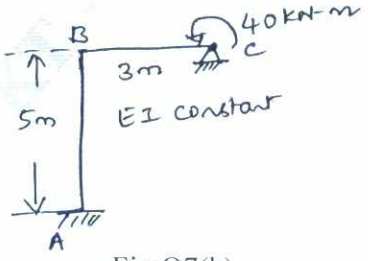

Fig.Q7(b)

OR

8 Analyse the pin-jointed frame shown in Fig.Q8 by flexibility method. The cross-sectional areas A and E for all members is the same. **(16 Marks)**

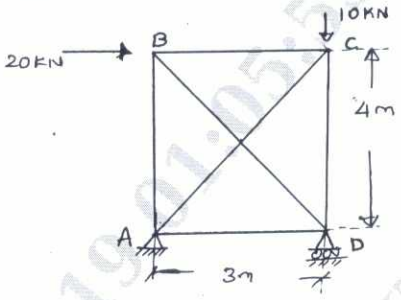

Fig.Q8

Module-5

9 a. Analyse the continuous beam shown in Fig.Q9(a) by stiffness method. Draw bending moment diagram. **(08 Marks)**

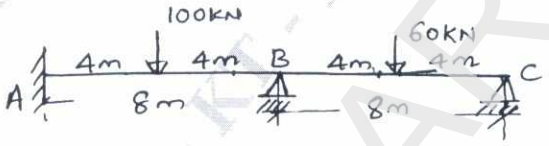

Fig.Q9(a)

b. Analyse the portal frame shown in Fig.Q9(b) by stiffness method. Draw bending moment diagram. **(08 Marks)**

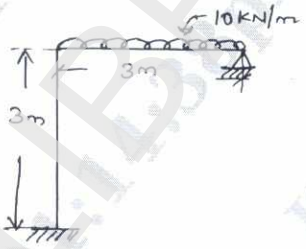

Fig.Q9(b)

OR

10 Using stiffness method determine the displacements at the joint 'B' of a pin-jointed frame shown in Fig.Q10. Also calculate the forces in the members AB and BC due to given loading. The values of area of cross-section are indicated. Take $E = 2\times10^5$ N/mm^2. **(16 Marks)**

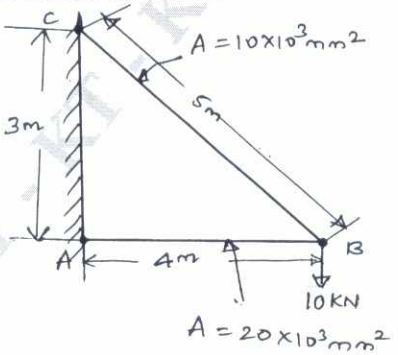

Fig.Q10

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15CV53

Fifth Semester B.E. Degree Examination, June/July 2019
Applied Geotechnical Engineering

Time: 3 hrs. Max. Marks: 80

Note: 1. ***Answer any FIVE full questions, choosing ONE full question from each module.***
2. ***Use of IS : 6403 is permitted.***

Module-1

1 a. Enumerate the objectives of subsurface exploration. **(04 Marks)**

b. Explain with reference to soil surplus : Area ratio , Inside clearance , Outside clearance and Recovery ratio. **(04 Marks)**

c. Estimate the position of ground water table from the following data :
Depth upto which water is boiled out is 32m. Water raise in the first day : 2.4m , Second day : 2.0m and Third day : 1.6m. **(08 Marks)**

OR

2 a. Distinguish between undisturbed , disturbed and representative soil samples. What are the tests conducted on these samples in the laboratory? **(05 Marks)**

b. Explain 'Seismic refraction method' of soil exploration, with a neat sketch on its mechanism. **(06 Marks)**

c. What is a Bore hole log? List the information recorded in it. **(05 Marks)**

Module-2

3 a. What do you understand by 'Pressure bulb'? Illustrate with a sketch. **(05 Marks)**

b. A circular area 6m is diameter , carries a uniformly distributed load of $10kN/m^2$. Plot the variation of vertical stress at depths 2m , 4m and 8m. **(06 Marks)**

c. Explain the principle of 'New – marks chart'. **(05 Marks)**

OR

4 a. What are different types of settlements of footings? Explain. **(04 Marks)**

b. Estimate the immediate settlement of a footing of size 2m × 3m resting at a depth of 1.5m in sandy soil whose compression modulus is $10N/mm^2$. Footing is expected to transmit a unit pressure of $200kN/m^2$. Poisson's ratio of soil is 0.3 and influence factor for footing is 1.06. **(04 Marks)**

c. A saturated clay 8m thick underlies a proposed new building. The existing overburden pressure at the centre of clay layer is $300kN/m^2$ and load due to new building increases the pressure by $200kN/m^2$. The liquid limit of soil is 75% with field water content = 50% and $G_S = 2.7$. Estimate consolidation settlement. **(08 Marks)**

Module-3

5 a. Explain step by step procedure of Culmann's graphical construction for determination of Active pressure. **(04 Marks)**

b. A 4.5m high retaining wall retains a cohesive soil with $C = 10kN/m^2$, $\phi = 20^0$ and $\gamma = 16kN/m^3$. Calculate the depth of tension cracks and critical depth. **(04 Marks)**

c. A retaining wall 6.6m high retains a cohesionless soil whose properties are $\phi = 25^0$, G = 2.6 and e = 0.6. The water table is at n depth of 2.1m below GL. Draw the earth pressure diagram and calculate magnitude and position of active earth pressure above the base of the wall. **(08 Marks)**

OR

6 a. What are the causes of slope failure? List and enumerate the types of failures in finite slopes. **(03 Marks)**

b. List and enumerate the types of failures in finite slopes. **(03 Marks)**

c. An embankment 6m high has a slope of 1V : 2H. The soil properties are $C = 5kN/m^2$, $\phi = 30^0$ and $\gamma = 19\ kN/m^3$. A trial slip circle of radius 8.8m and passing thro' the toe has its centre at the same level as the top of embankment. Find the factor of safety by the 'method of slices'. **(10 Marks)**

Module-4

7 a. Define Ultimate bearing capacity, Safe bearing capacity and Allowable bearing pressure. **(03 Marks)**

b. List the assumption made in Terzagh's b.c theory. **(03 Marks)**

c. Determine the safe bearing capacity of a square footing of side 1.8m, located at a depth of 1.5m below GL in a soil having $\gamma = 16.2\ kN/m^3$, $C = 15kN/m^2$ and $\phi = 35^0$. Take $N_c = 57.8$, $N_q = 41.1$ and $N_r = 42.4$ with FS = 3. Assume water tank at great depth, what will be the SBC if WT rises to the base of footing. **(10 Marks)**

OR

8 a. Explain the three modes of shear failure below the footing, with neat sketches. **(04 Marks)**

b. Discuss the effect of size and shape on the bearing capacity of footing on :
i) Sand ii) Clay. **(04 Marks)**

c. Proportion a square footing to carry a load of 900kN from a column 400 × 400mm in section and located at a depth of 1.5m below GL. The soil has $C = 0$, $\phi = 36^0$, $\gamma = 17.5kN/m^3$ above water table and $\gamma_{sat} = 20kN/cm^3$ below water table(WT). The WT is at the base of the footing. Permissible settlement is 25mm, Corrected N – Value = 30. Use a FS = 2.
[Use of IS : 6403 is permitted]. No structural design required. **(08 Marks)**

Module-5

9 a. Classify the pile foundations according to material and function, with neat figures. **(04 Marks)**

b. Explain in detail, the principle associated with determination of pile load capacity using static formula. **(04 Marks)**

c. A 12m long, 30mm dia. pile is driven in uniform deposit of sand with $\phi = 40^0$. The W.T is at great depth. The average dry unit weight of sand is $18kN/m^3$. Using Nq = 137, calculate the safe lad capacity of single pile with a FS = 2.5 and angle of wall friction (δ) = 30^0. **(08 Marks)**

OR

10 a. What is meant by efficiency of pile groups? Discuss Feld's rule for its determination. **(04 Marks)**

b. What is Negative friction? Under what situation negative skin friction occurs. **(04 Marks)**

c. Calculate the safe load carrying capacity of a 16 pile group arranged in a square pattern with each pile is of 400mm diameter, 9m length and with a spacing of 1.2m c/c. The soil is 14m deep clay with unconfined strength of $100kN/m^2$, $r = 16kN/m^3$ and $r^1 = 9kN/m^3$ with adhesion factor (α) = 0.7. W.T is 1m below GL. Use a FS = 2.5. **(08 Marks)**

* * * * *