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10CV52

Fifth Semester B.E. Degree Examination, June/July 2013
Design of RCC Structural Elements

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO questions from each part.*
2. Use of IS456-2000 is permitted.(Use of SP-16 not permitted)
3. Assume M_{20} Grade concrete and Fe_{415} Grade steel for all the problems.

PART – A

1 a. What is limit state? Explain different limit states to be considered in the design of RC beams. **(06 Marks)**

b. Explain the necessity of adopting partial safety factors for loads and material strength. **(04 Marks)**

c. Show that $x_{umax} = 0.46d$, for Fe_{500} grade steel. **(05 Marks)**

d. What is an under reinforced section? What are its advantages? **(05 Marks)**

2 a. A R.C. beam section 230mm × 500mm is reinforced with 4 bars of 16mm diameter at an effective cover of 40 mm. Find the ultimate moment of resistance of the beam. Also calculate M_u limit for the given section. **(08 Marks)**

b. A Tee beam has the following data:
i) C/c spacing of beam = 3.20 mtr. ii) Simply supported effective span of beam = 8 mtr.
iii) Depth of slab = 150 mm iv) Size of web of beam = 300mm × 500mm
Calculate the balanced moment of resistance and corresponding area of steel. **(12 Marks)**

3 a. What are the major factors which influence crack width in RC beams? **(04 Marks)**

b. A simply supported RC beam of size 250mm × 600mm carries a uniformly distributed live load of 25 kN/m and superimposed dead load of 12 kN/m, over an effective span of 5m. It is reinforced with 4 nos of 20 mm diameter bars. The effective cover is 50 mm. Calculate the short term and long term deflection of the beam. $\varepsilon_{cs} = 0.0003$, and creep coefficient = 1.6. **(16 Marks)**

4 A rectangular RC beam of size 250mm × 600mm of effective simply supported span of 7m has to support service load 26.25 kN/m excluding self weight. The effective cover = 50 mm. Design the beam for flexure and shear. Check the beam depth for control of deflection using empirical method. Design stress values for different strain in steel are given below. **(20 Marks)**

Strain	Stress (N/mm^2)
0.00276	351.8
0.00380	360.9

PART – B

5 a. Distinguish between one way and two way slab. **(04 Marks)**

b. Design a two way slab for a room of internal dimension 4m × 5m, supported on walls of 300mm thickness with one corner held down. Two adjacent edges of the slab are discontinuous. Thickness of slab = 150mm. The slab is to support a live load of 3 kN/m^2 and floor finish of 1 kN/m^2. Sketch the reinforcement details. **(16 Marks)**

6 a. What is the necessity of transverse reinforcement in columns? **(03 Marks)**

b. Design a rectangular column, 5m long, restrained in position and direction at both the ends, to carry an axial load of 1200 kN. Check for slenderness of column and minimum eccentricity. **(09 Marks)**

c. A circular column of diameter 480mm is reinforced with 7 bars of 16 mm diameter with a clear cover of 40 mm. The column is provided with helical reinforcement using 8 mm diameter bars at a spacing of 70 mm. Find the maximum load that the column can carry and check the spacing of helical reinforcement. **(08 Marks)**

7 a. What are the advantages of providing pedestal to columns? **(03 Marks)**

b. Design a rectangular RC footing for a reinforced concrete column of size 300mm × 500mm to carry an axial load of 1200 kN. SBC of soil = 200 kN/m^2. Adopt width of footing = 2.0m. **(17 Marks)**

8 a. Design one of the flights of a doglegged stairs supported on 300 mm wide beams at the ends, using following data:
No. of steps = 10; Tread = 300 mm ; Rise = 150 mm
Width of stairs = 1.20 m ; Length of landing on either side = 1.2 m.
Beams are provided at the ends of landing slab and the landing slab spans along the stairs. Adopt thickness of waist slab = 180 mm. Sketch the reinforcement. Live load = 3 kN/m^2. **(10 Marks)**

b. Design the middle flight of a open well type stair case to be provided for a stair hall of size 3.25m × 3.25m. Size of open well = 1.25m × 1.25m. Floor to floor height = 3.6m. Size of landing at each corner = 1m ×1m. Stair had to be provided along all the four walls of hall. Thickness of stair hall wall is 230 mm. The stair slab is embedded in to the wall by 200 mm. The service love load is 3 kN/m^2. **(10 Marks)**

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10CV53

Fifth Semester B.E. Degree Examination, June/July 2013
Structural Analysis - II

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may be suitable assumed.

PART – A

1 a. A simply supported beam of 15 m span is subjected to uniform dead load of 50 kN/m covering the entire span and a uniform live load of 100 kN/m (longer than the span). Determine the maximum value of positive as well as negative shear force at left quarter span. **(08 Marks)**

b. A train of five wheel loads crosses a span of 30 meters

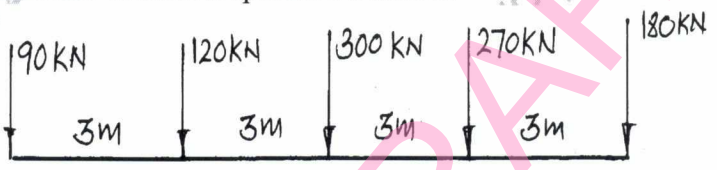

Fig. Q1(b)

Calculate the maximum positive and negative shear at midspan and the absolute maximum bending moment anywhere in the span. **(12 Marks)**

2 Analyse the farme shown in Fig. Q2 by using slope deflection method. Draw BMD, SFD and also sketch the elastic curve. **(20 Marks)**

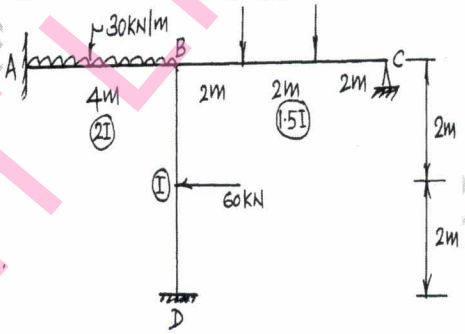

Fig.Q2

3 Analyse the frame shown in Fig. Q3 by using moment distribution method. Draw BMD, SFD and also sketch the elastic curve. **(20 Marks)**

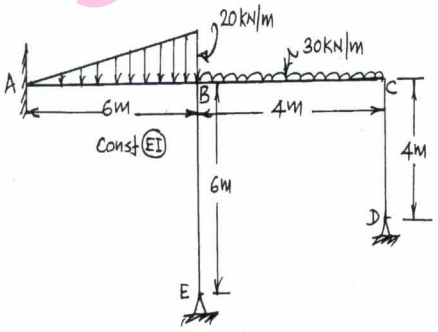

Fig. Q3

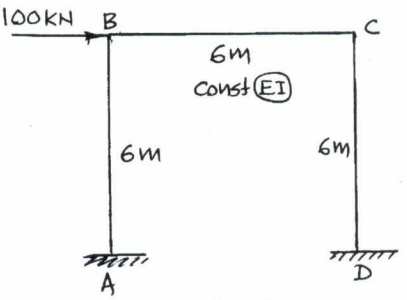

Fig. Q4

4 Analyse the frame shown in Fig. Q4 by using moment distribution method. Draw BMD, SFD and also sketch the elastic curve. **(20 Marks)**

PART – B

5 A continuous beam shown in Fig. Q5 has rigidly fixed ends C and D, is pinned at E and has rigid joints at A and B. The members are of uniform sections and material throughout. Sketch the bending moment diagram for the frame, showing all important values. Also find the values of the horizontal and vertical reactions at D and E. use Kani's method. **(20 Marks)**

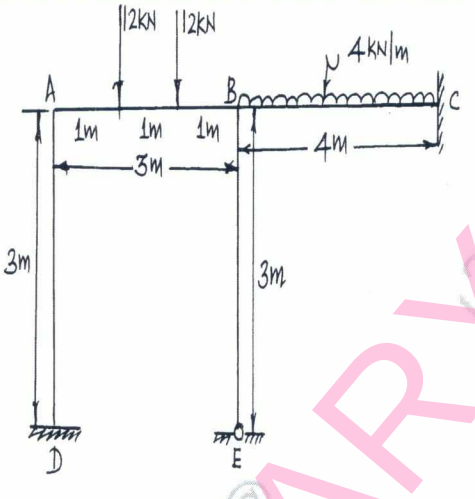

Fig. Q5

6 Analyse the continuous beam shown in Fig. Q5 by the flexibility method and draw the bending moment diagram. **(20 Marks)**

Fig. Q6

7 Analyse the frame shown in Fig. Q7 by the matrix stiffness method. Draw the bending moment diagram. **(20 Marks)**

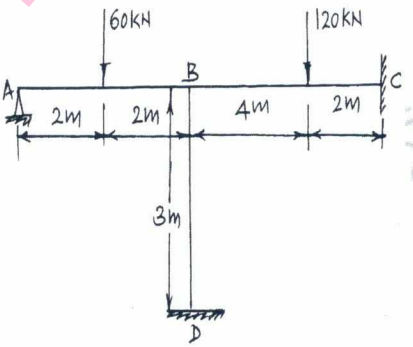

Fig. Q7

8 a. Explain the following :
   i) Period and frequency
   ii) Damping
   iii) Forced vibration
   iv) Single degree of freedom system. **(04 Marks)**

   b. Develop the solution for a differential equation of a body, when it is under :
   i) Free undamped vibration
   ii) Free damped vibration. **(16 Marks)**

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10CV54

Fifth Semester B.E. Degree Examination, June / July 2013
Geotechnical Engineering - I

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO question from each part.***
2. Missing data, if any, may be suitable assumed.

PART – A

1 a. With the help of the phase diagram, define the following : i) Voids ratio ii) Porosity iii) Degree of saturation iv) Water – content. **(06 Marks)**

b. Considering soil as a three phase system, derive the following with usual notations :

$$r_d = \frac{(1-n_a)G.r_w}{1+WG}.$$ **(06 Marks)**

c. A sample of saturated clay has a water content of 30% and unit weight of 20kN/m^3. Determine its dry unit weight, specific gravity, voids ratio. If the degree of saturation reduces to 50%, what will be its unit weight? **(08 Marks)**

2 a. Explain three correction applied to hydrometer readings. **(06 Marks)**

b. Discuss 'particle size distribution curve'. Explain how the gradation of soil can be determined using the curve. **(06 Marks)**

c. A liquid limit test was conducted on a soil sample whose natural water content is 28% and plastic limit being 21% and the following results were obtained :

Number of blows	10	19	23	27	40
Water – content (%)	60	45.2	39.8	37	25

Draw the flow curve and determine : i) Liquid limit ii) Liquidity Index and iii) Voids ratio at liquid limit, if G = 2.7. **(08 Marks)**

3 a. With neat sketches, explain the structure of Kaolinite, Illite and Montmorillonite clay minerals. **(06 Marks)**

b. Discuss the significance and use of IS. Plasticity chart. **(06 Marks)**

c. Classify the following soils as per I.S classification system. **(08 Marks)**

Soil	Liquid limit (%)	Plasticity Index (%)	% Passing 4.75mm Sieve	% Passing 75μ Sieve
A	40	10	62	48
B	40	6	98	52

4 a. Define coefficient of permeability and explain any three factors affecting permeability. **(06 Marks)**

b. Derive expressions for average permeability of stratified soils when flow is parallel and perpendicular to the direction of stratification. **(06 Marks)**

c. The following details refers to a test to determine the permeability of a soil : Thickness of specimen = 25mm ; Diameter of specimen = 75 ; Diameter of standing pipe = 10mm ; Initial head at start = 1000mm ; Water level after 3hr.20minutes = 800mm. Determine permeability of soil. If voids ratio of the sample is 0.75, what is the permeability of same soil at a voids ratio of 0.90? **(08 Marks)**

PART – B

5 a. Differentiate between total stress and effective stress parameters. **(04 Marks)**

b. Explain briefly the Mohr – Coulomb shear strength theory. **(06 Marks)**

c. Distinguish sensitivity and thixotropy. **(04 Marks)**

d. A series of direct shear tests were conducted on a soil, with following results being obtained at failure.

Sℓ. No	Normal stress (kN/m^2)	Shear stress (kN/m^2)
1	15	18
2	30	25
3	45	32

Determine shear strength parameters C and ϕ. Draw Mohr's circle and determine principal stresses and direction of principal planes at $\sigma = 30\ kN/m^2$. **(06 Marks)**

6 a. Discuss the factors affecting compaction of soils. **(06 Marks)**

b. What are the differences between standard and modified Proctor's tests? Calculate the compactive energy applied in both the tests. **(06 Marks)**

c. Standard Proctor test conducted on a soil gave the following results :

Bulk Density (kN/m3)	18.0	19.0	19.6	20.5	21.0	20.5	20.1
Water content (%)	9.6	11.0	12.5	14.0	16.0	18.0	19.5

Find OMC and maximum dry density by plotting compaction curve. Determine degree of saturation at OMC, if G = 2-68. **(08 Marks)**

7 a. Explain with spring analogy, Terzaghi's theory of one dimensional consolidation. **(06 Marks)**

b. Explain Casagrande's method of determination of preconsolidation pressure. **(06 Marks)**

c. Saturated soil of 5m thick lies above an impervious stratum and below a pervious stratum. It has a compression index of 0.25 with $k = 3.2 \times 10^{-10}$ m/sec. Its voids ratio at a stress of $147kN/m^2$ is 1.9. Compute i) The change in voids ratio due to increase of stress to $196kN/m^2$ ii) Coefficient of volume compressibility iii) Coefficient of consolidation iv) Time required for 50% consolidation. **(08 Marks)**

8 a. How the shear tests are classified on the basis of drainage conditions? **(06 Marks)**

b. With a neat sketch, explain square root of time fitting method for determining coefficient of consolidation. **(06 Marks)**

c. The effective overburden pressure at the centre of saturated clay layer is $120kN/m^2$. The thickness of the layer is 4m. The effective pressure at the centre of the layer increases by $60kN/m^2$ due to a construction. Determine settlement due to consolidation given that :
i) Natural water content = 36% ii) Liquid limit = 64% iii) Specific gravity = 2.71
iv) Initial voids ratio = 0.22. **(04 Marks)**

d. A cylindrical specimen of a saturated soil fails at an axial stress of $180kN/m^2$ in an unconfined compression test. The failure plane makes an angle of 54^0 with horizontal. Calculate the shear strength parameters of soil. **(04 Marks)**

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