Candidate should write his/her Roll No. here.

Total No. of Questions : 03

No. of Printed Pages : 07

M-SFS-I-2017 (10)
CIVIL ENGINEERING
(Optional Subject)
First Paper

Time : 3 Hours]

[Total Marks : 200

Instructions to the candidates :

1. This question paper consists of **three** questions and all questions are compulsory.

2. Marks for each question have been indicated on the right hand margin.

3. There is no internal choice in Question No. 1, remaining questions carry internal choice.

4. The first question is of very short-answer type consisting of **15** compulsory questions. Each one is to be answered in one or two lines. Question No. 2 is short answer type, word limit is **100**. Question No. 3 is long answer/Essay type, word limit is **300**.

5. Wherever word limit has been given, it must be followed to.

6. Question should be answered exactly in the order same as mentioned in the question paper. Answer to the various parts of the same question should be written together compulsorily and no answer of the other question should be inserted between them.

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Answer **All** questions. $15 \times 4 = 60$

1. (A) Find the maximum deflection of a cantilever beam of length 'L' carrying a uniformly distributed load w/unit length over the entire span.

    (B) List out any two assumptions in Theory of Bending.

    (C) An uniformly distributed load of 10 kN/m and 4 m long rolls over a girder of 10 m span. Find the absolute maximum bending moment in the span.

    (D) Determine the 2 × 2 stiffness matrix of the beam system shown in fig.

$$l = 3, A = 1, E = 2, I = 3$$

    (E) Under which circumstances, the riveted joint failures would occur?

    (F) According to IS : 800 – 1984, the minimum thickness of a square base for a solid round steel column is given by _____.

    (G) If 'w' is the uniformly distributed load per unit area on a circular slab of radius 'R' is freely supported at edges, then what will be the maximum circumferential moment at the midspan and supports?

(H) Find the Moment of Resistance of a singly reinforced concrete beam of 200 mm width and 400 mm effective depth reinforced with 3 – 16 mm diameter bars of Fe – 415 Steel. Take M_{20} concrete.

(I) Give the applicability of network techniques adopted for project planning and scheduling.

(J) Mention the basic requirement for the procurement of Construction stores followed as a golden rule.

(K) Draw the network path for the project consists of five activities A, B, C, D and E. The activities A and B can start concurrently. The activity can start only after A and B are completed, D starts after B is finished and E can start only after C and D are finished.

(L) Write down the fanning's formula to determine the quantity of storm water.

(M) As per IS : 3307 – 1965, what are the tolerance limits for industrial effluents discharged on land ?

(N) How the total quantity of water required by a town is estimated ?

(O) Sludge is collected from primary settling tank. Its volume was 145 m³ at moisture content of 95%. If after exposing it to the atmosphere, its water content reduces to 80%, determine its volume.

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2. Answer any TEN questions : $10 \times 8 = 80$

    (A) Derive the maximum and minimum normal stress, maximum shear stress for an oblique section subjected to direct stresses in two mutually perpendicular directions accompanied by a simple shear stress.

    (B) A single rolling load of 100 kN moves on a girder of span 20 m.

        (i) Construct the influence lines for shear force and Bending moment for a section 5 m from the left support.

        (ii) Construct the influence lines for points at which the maximum shears and maximum Bending moment develop. Determine these maximum values.

    (C) Determine the fixed end moments of the continuous beam loaded as shown in figure by the slope deflection method. Support B sinks by 10 mm. Take $E = 2 \times 10^5$ N/mm^2, $I = 16 \times 10^7$ mm^4. Sketch the Bending moment and Shear force diagrams.
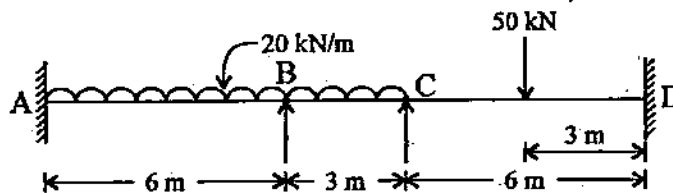
    (D) Calculate the value of the least radius of gyration for a compound column consisting of ISHB 250 @ 536.6 N/m with one cover plate 300 mm × 20 mm on each flange.

(E) How are column buckling and the lateral buckling of beam similar ?

(F) Determine the horizontal pressures developed at 5 m intervals in a cement silo of internal diameter 10 m and height 30 m using Janssen's Theory.

(G) Discuss in detail the design principles to be followed for a shallow foundation.

(H) Enumerate the features of Gantt chart used for project planning and scheduling.

(I) Elaborate the test carried out in determining the consistency of cement.

(J) Design a secondary settling tank of an activated sludge plant for 50 mLd (peak flow) operating with an MLSS of 3000 mg/l.

(K) Determine the velocity of the flow in a sewer running one half full. The sewer is laid at 1 in 550 slope. The diameter of the sewer is 150 cm. Also determine the discharge flowing through the sewer. Assume N = 0.012 in Manning's formula.

(L) Why the softening of water is necessary ?

(M) The following are the population data collected from Census department :

Year	Population
1940	8,000
1950	12,000
1960	17,000
1970	22,500

Calculate the probable population in the year 1980, 1990 and 2000 by Arithmetic Increase Method.

3. Answer any **THREE** questions : $3 \times 20 = 60$

(A) A symmetrical three hinged parabolic arch of span 40 m and rise 8 m carries an uniformly distributed load of 30 kN/m over the left half of the span. The hinges are provided at the supports and at the centre of the arch. Calculate the reactions at the supports. Also calculate the Bending moment, radial shear and normal thrust at a distance of 10 m from the left support.

(B) Find out the fully plastic moment in the portal frame shown in figure. The frame has a uniform cross-section throughout.
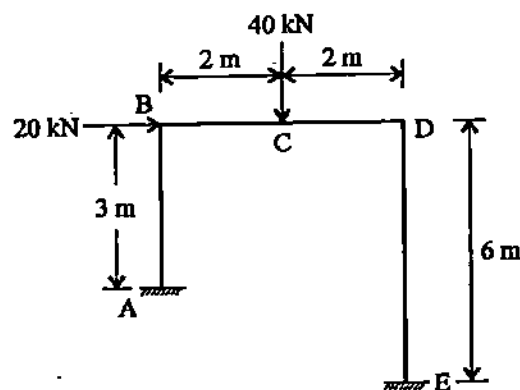
(C) Design the side walls of a circular cylindrical bunker to store 20 tonnes of coal. Density of coal = 9 kN/m^3, Angle of repose is 30 degrees. Adopt M$_{15}$ grade concrete and Fe – 415 steel.

(D) The cost of construction emphasize the planning and scheduling of Construction Industry. Discuss.

(E) What are the requirements of a good distribution system ? Describe in brief various types of distribution systems.