

Code—05

CIVIL ENGINEERING

Time : 3 Hours

Maximum Marks : 150

Note : Attempt any *Five* questions. All questions carry equal marks. Q. No. 1 is compulsory. Answer *two* questions from Part I and *two* questions from Part II. The parts of the same question must be answered together and must not be interposed between answers to other questions.

1. Attempt any *four* of the following : ($4 \times 7\frac{1}{2} = 30$)
 - (a) A beam ABC is fixed at A and simply supported at B with BC as overhang. $AB = l$ and $BC = a$. A load W acts at C. Draw the bending moment diagram, marking salient values.

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- (b) Distinguish between compaction, consolidation and stabilisation of soils.
- (c) What is the hydraulic mean depth of a triangular section of depth ' d ' and side slopes 1 vertical to ' n ' horizontal ?
- (d) What is the property measured by slump test ? Give a brief description of the test.
- (e) What is BOD ? Explain the first stage and second stage of BOD.
- (f) Define the three sight distances considered in design.

Part I

2. (a) A steel T-section has the following dimensions. Total depth = 11 cm. Breadth of flange = 10 cm. Thickness of flange and web = 1 cm. Locate the centroid. If the section is subjected to a shear force F , show how the shear stress varies across the depth, by a suitable sketch. Indicate the level at which the stress is maximum. (15)

- (b) Show the diagrams of lateral earth pressures for a cantilever retaining wall retaining earth as :
- (i) level with the top of the wall.
 - (ii) level surcharge upto a small height above top of the wall.
 - (iii) sloping surcharge.
 - (iv) earth level with the top of the wall, submerged condition for half the height. Mark the intensity of lateral pressure at salient points, using the usual notation. (15)
3. (a) In the limit state design of reinforced concrete beams why is it necessary to design the section as 'under reinforced' ? Explain how the Indian standard code ensures that the R.C.C. sections are under reinforced. (15)
- (b) Explain how the head loss is practically eliminated by using a convergent-divergent mouth-piece. Derive the condition of maximum discharge for this type of mouth-piece. (15)

4. (a) Explain with a suitable sketch the construction of Mohr's circle for given values of principal stresses. Explain how the normal and shear stresses acting on a plane can be calculated using the circle. Sketch the circle for a rod under direct tension. (15)
- (b) The cross-section of a steel column consists of two channel sections arranged such that the buckling load is same for both x -axis and y -axis buckling. Derive the necessary expression. (15)

Part II

5. (a) List the different methods of setting out simple curves. Describe any *two* methods in detail. (15)
- (b) What are the common defects in timber? Describe any *two* methods of seasoning for timber. (15)

6. (a) List different types of cut backs. When are these used ? Discuss briefly any *two* tests for cut back bitumen. (15)
- (b) Draw the network for the following project and number the events according to Fulkerson's rule : (15)

Event number	Preceded by
A	start
B	A
C	B
D	B
E	D
F	B
G	E
H	G, E
J	D, E, F
K	C, J
L	K

7. (a) Describe briefly :
- (i) isohyetal method
 - (ii) unit hydrograph
 - (iii) stage-discharge rating curve. (15)

- (b) Explain why sludge digestion is necessary. Describe how the digested sludge and supernatant liquor are disposed off. What is the effect of pH, temperature, mixing and seasonal storage on sludge digestion ? (15)