

4TH/CIVIL/ 2022(S)
TH1 Structural Design -I

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. Define modular ratio.
 - b. What do you mean by characteristic strength of concrete?
 - c. How do you determine the minimum depth of foundation?
 - d. What is curing?
 - e. Define Limit state. State various types of limit state.
 - f. Differentiate between one-way and two-way slab.
 - g. What is the minimum and maximum longitudinal reinforcement permissible in a column?
 - h. What do you mean by redistribution of moment?
 - i. Define slenderness ratio. What is its importance?
 - j. Draw a typical flight and show tread, riser, waist and going.
2. Answer **Any SIX** Questions 6 x 5
 - a. Write about advantages of LSM over WSM?
 - b. Design a short circular column to carry a service load of 1600KN use lateral ties and helical reinforcement. The materials are M20 grade concrete and Fe415 steel.
 - c. Design a square footing for a RCC column 250mmx250mm carrying a load of 300KN founded on soil that has SBC of 160KN/m² in LSM use M20 and Fe415 steel .
 - d. A steel bar of 10mm diameter of Fe415 grade is embedded in M20 concrete. Calculate its development length in tension and compression ($\phi = 90^\circ$).
 - e. Derive the stress block parameters for flexure.
 - f. Write the assumptions made in the limit state of collapse compression.
 - g. Explain in details why Under-reinforced section is preferred than Over reinforced section.
3. Design a simply supported rectangular beam in flexure to resist a factored load of 90KN/m. Given a clear span of 6m and the size is limited to 30cm x 60cm. Use M20 grade concrete and Fe500 steel. 10
4. A RCC beam of span 5m is 250mm wide 500mm deep (effective). It has 4 bars of 22mm tensile reinforcement. The beam carries a load of 30KN/m inclusive of self weight. Design the beam for shear. Use M20 concrete and Fe415 steel. 10
5. Design a dog legged staircase for a live load of 3 KN/m². Rise of the stair is 160mm and tread is 250mm, Ceiling height is 3.5m and width of flight is 150mm use M20 concrete and Fe415 steel. 10
6. Design a simply supported one way roof slab for a room 8mx3.5m clear in size if superimposed load is 5 KN/m² use M20 grade concrete a Fe415 steel. 10
7. Design a RCC column to resist axial factored load of 1800KN .Given column length of 3m with both end fixed using M20 grade concrete and Fe415 steel. 10

4TH SEM./CIVIL/2022(S)
Th2 Hydraulics and Irrigation Engineering

Full Marks: 80

Time- 3 Hrs

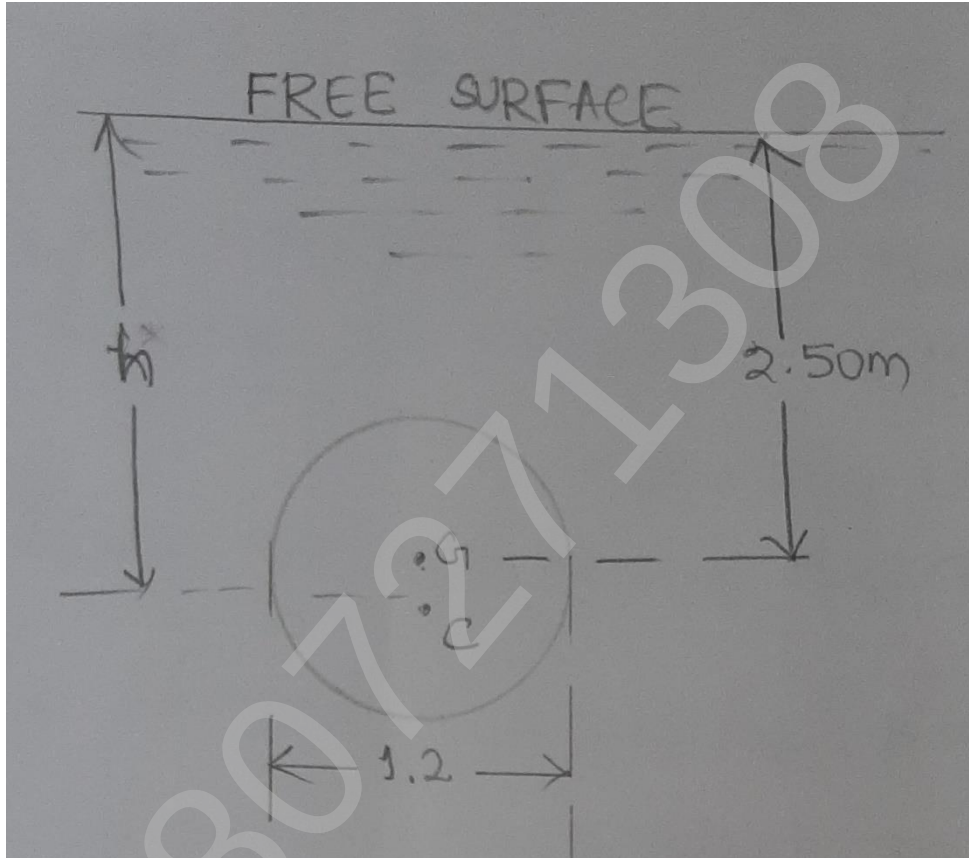
Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. List out different types of rain gauges.
 - b. What do you mean by gross command area.
 - c. Write two benefits of irrigation.
 - d. What is an aqueduct.
 - e. Define spillway.
 - f. Define viscosity and its unit in C.G.S system.
 - g. What is the difference between laminar flow and turbulent flow.
 - h. Write down Darcy – Weisbach and Chezy's formula.
 - i. Differentiate between notch and weir.
 - j. Define duty of irrigation water.

2. Answer **Any Six** Questions 6 x 5
 - a. Define base, delta and duty and derive the relationship between them.
 - b. Write different types of canal lining. What are the advantages and disadvantages of canal lining.
 - c. Write down the effects of water logging.
 - d. Derive continuity equation.
 - e. Find the loss of head due to friction in a pipe of 1 metre diameter and 15 km long. The velocity of water in the pipe is 1 meter/sec. Take coefficient of friction as 0.005.
 - f. What are the causes of failure of gravity dam.
 - g. The diameter of a pipe at sections 1-1 and 2-2 are 200 mm and 300 mm respectively. If the velocity of water flowing through the pipe at section 1-1 is 4 m/sec. Find discharge through the pipe and velocity of water at section 2-2.

- 3 Explain the types of cross drainage work with neat sketch. 10
- 4 Name the component parts of the diversion head works and state their functions. 10
- 5 What is a reciprocating pump? Describe the principle and working of a reciprocating pump with neat sketch. 10

- 6 Figure shows a circular plate of diameter 1.2 m placed vertically in water in such a way that the centre of the plate is 2.5 m below the free surface of water. Determine 10
- (i) Total pressure on the plate
 - (ii) Position of centre of pressure.



- 7 The water is flowing through a taper pipe of length 100 m having diameters 600 mm at the upper end and 300 mm at the lower end, at the rate of 50 litres/sec. The pipe has a slope of 1 in 30. Find the pressure at the lower end if the pressure at the higher level is 19.62N/cm². 10

TH3 LAND SURVEY-I

Full Marks: 80

Time- 3 Hrs

Answer any five Questions including Q No.1& 2
Figures in the right hand margin indicates marks

1. Answer **All** questions 2 x 10
 - a. What is Simpson's rule for calculation of area in survey?
 - b. What is parallax?
 - c. Define latitude and departure of a survey line
 - d. What is the principle of reciprocal levelling?
 - e. What is meant by unique identification number of parcel in map preparation?
 - f. Why optical square is used in surveying?
 - g. What is a field book? What are the types of field books?
 - h. Convert the following WCBs to QB
 - a. $160^{\circ} 25'$
 - b. $285^{\circ} 30'$
 - c. $15^{\circ} 45'$
 - d. $203^{\circ} 30'$
 - i. Define isogonic and agonic lines.
 - j. Why well conditioned triangles are preferred in chain surveying?
2. Answer **Any Six** Questions 6 x 5
 - a. Enlist and explain the function of each instrument used in plane table surveying with neat sketch.
 - b. Explain about cadastral map preparation methodology.
 - c. The following offsets were taken from a chain line to an irregular boundary line at an interval of 10m:
0, 2.50, 3.50, 5.00, 4.60, 3.20, 0m
Compute the area between the chain line, the irregular boundary line and the end offsets by (a) The mid-ordinate rule & (b) The trapezoidal rule.
 - d. Explain the procedure to set out an angle of $30^{\circ} 40' 13''$ with theodolite.

- e. A 30m steel tape was standardised at a temperature of 20°C and under a pull of 5 kg. The tape was used in catenary at a temperature of 25°C and under a pull of 11 kg. The cross sectional area of tape is 0.02 cm^2 and its total weight is 660 gm. Find the correct horizontal distance. Take $E=2\times 10^6\text{ kg/cm}^2$ & $\alpha=11\times 10^{-6}/^{\circ}\text{C}$.
- f. Explain about characteristics of contours with neat sketch.
- g. Differentiate between Surveyor Compass and Prismatic Compass.

3 Explain the procedure for solving two point and three point problems in plane table surveying. 10

4 The following bearings were observed in traversing with a compass in an area where local attraction was suspected. Find the stations affected with local attraction and calculate the correct bearings of lines. 10

Line	FB	BB
AB	$68^{\circ} 15'$	$248^{\circ} 15'$
BC	$148^{\circ} 45'$	$326^{\circ} 15'$
CD	$224^{\circ} 30'$	$46^{\circ} 00'$
DE	$217^{\circ} 15'$	$38^{\circ} 15'$
EA	$327^{\circ} 45'$	$147^{\circ} 45'$

5 Explain the procedure of chaining to overcome an obstacle where chaining is obstructed but vision is free. 10

6 Write the procedure for finding area using Latitude and Double Meridian Distance method and find out the area of a closed traverse considering following data by Latitude and DMD method 10

SIDE	LATITUDE	DEPARTURE
AB	+225.5	+120.5
BC	-245.0	+210.0
CD	-150.5	-110.5
DA	+170.0	-220.0

7 The following consecutive readings were taken with a dumpy level along a chain line at a common interval of 15m. 10

3.150, 2.245, 1.125, 0.860, 3.125, 2.760, 1.835, 1.470, 1.965, 1.225, 2.390, and 3.035m.

The first reading was at a chainage of 165m where RL is 98.085. The instrument was shifted after the fourth and ninth readings. Find RL of all points using rise-and-fall method.

4TH SEM./CIVIL/ 2022(S)
TH4 Highway Engineering

Full Marks: 80

Time- 3 Hrs

Answer any FIVE Questions including Q No.1& 2
Figures in the right hand margin indicates marks

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| 1. | Answer All questions | 2 x 10 |
| | a. What is camber ? | |
| | b. Differentiate between bitumen and tar. | |
| | c. What are the objectives of highway planning. | |
| | d. Define traffic density? | |
| | e. What do you mean by seal coat ? | |
| | f. Define base course and wearing course. | |
| | g. What is highway alignment? | |
| | h. What is function of surface drainage and sub surface drainage? | |
| | i. Define transition curve? | |
| | j. Define WBM. | |
| 2. | Answer Any SIX Questions | 6 x 5 |
| | a. Calculate the safe stopping sight distance for design speed of 50kmph for
(i) Two way traffic on a two lane road (ii) Two way traffic on a single lane road. Assume
coefficient of friction =0.35 & reaction time=2.5 second. | |
| | b. Write the objectives of providing transition curve in roads. | |
| | c. Explain the necessity of road drainage work. | |
| | d. Describe different types of bends in hill roads | |
| | e. Write short notes on CBR test. | |
| | f. Differentiate flexible and rigid pavement. | |
| | g. Calculate the allowable speed on a horizontal curve of radius 180m. Assume the co-
efficient of lateral friction as 0.15 and maximum super elevation of 1 in 15. | |
| 3 | What is soil stabilization, briefly explain cement stabilization? | 10 |
| 4 | (a)What is highway drainage? | 2 |
| | (b)Explain surface drainage and subsurface drainage systems in road. | 8 |
| 5 | Explain typical flexible pavement failures in detail. | 10 |
| 6 | Explain the total reaction time for a driver. | 10 |
| 7 | Write short notes on: | 10 |
| | (a) Mud pumping. | |
| | (b) Super elevation | |
| | (c) National Highways | |
| | (b) Kerbs | |