Structural Design-I (4th Sem Civil Engg)

2 Marks question.

1) Which type of section is known as under-reinforced?

2) What is the value of modular ratio for M15 concrete & Fe250 steel?

3) Calculate the value of neutral axis constant for M120 grade concrete & mild steel reinforcement in WSM?

4) Explain the term modular ratio?

5) Write 2 advantages of RCC over other materials.

6) Define a balanced section.

7) Define moment of resistance

8) What are the objectives of design and detailing of a concrete structure?

9) Define characteristic strength as per IS 456-2000.

10) Write down the codal provisions for min^m reinforcement in i) beams ii) slab iii) columns.

11) Define limit state of serviceability.

12) Write down the functions of cover in RCC structural elements

13) What do you mean by limit state.

14) Differentiate bet^n limit state of collapse & limit states of serviceability.

15) Why partial safety factors are used in limit state analysis?

16) Give two reasons why doubly reinforced sections are adopted.

17) Mention any 2 advantages of a doubly reinforced beam.

18) State reasons why over-reinforced section is not allowed in limit state method of design.

19) What is the effective span of a simply supported beam or slab which is not built integrally with its support?

20) Write the expression for effective width of flange of an isolated T-beam.

21) Explain the term splicing.

22) find out the anchorage length in tension in a single mild steel bar of dia ϕ in concrete of grade M25.

23) What is the function of bent up bars in a simply supported beam?

24) Define development length.

25) Write the IS code provision for effective width of flange for an isolated T-beam.

26) Find the development length required for a bar of 16 mm diameter of grade Fe415 with M20 concrete in tension.

27) ~~What~~ How cracks are prevented due to diagonal tension in RCC beams?

28) How the design bond stress will be calculated for a deformed bar in compression?

29) What are the codal provisions of stripping time for removal of props to beams?

30) What is the min^m % of distribution steel for a slab for mild steel & HYSD steel?

31) Write the purpose of providing distribution steel in RCC slabs.

32) What should be the min^m dia. of bars to be used in slab?

33) Explain one way & two way slab.

34) Explain the term lap length.

35) What do you mean by nominal cover and how does it very with exposure cond^n?

36) Where is the critical section for max^m B.M. of an RCC footing situated?

37) Give two important purpose of providing lateral ties in column.

38) What is the cover requirement of footing?

39) What is the min^m no of bars for a circular column section?

40) Explain braced and unbraced column.

41) What should be the min^m & max^m dia of bars to be used in slabs?

42) What is the pitch of helical reinforcement in RCC columns?

43) State the reason for designing axially loaded columns for minm eccentricity as per IS 456.

44) Write down the different methods of design of concrete structure.

45) Define staircase.

5 marks question

1) Find the MOR of the RCC beam section shown in fig, if the stresses in steel & concrete are not to exceed 230 N/mm² & 7 N/mm² respectively. Take m = 13.33 & use WSM.
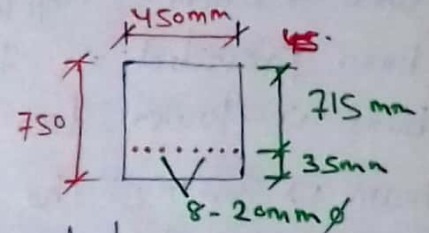
2) A reinforced concrete beam is simply supported over a span of 5m and it carries a uniformly distribution load of 25 000 N/m including its own weight. If the size of the beam is restricted to 300 mm × 500 mm, determine the areas of tension & compression steel if required. Given M20 concrete & HYSD bars of fe 415. Use WSM.

3) State the different methods of design of concrete structure & explain it.

4) A singly reinforced rectangular beam of width 250mm & 460mm effective depth is reinforced with 3 no 20mm dia bars. Find out the MOR of the section.

5) Write down the assumption in Limit state of collapse in compression.

6) State the assumptions made in limit state design of flexural members.

7) Derive the expressions for stress block parameters for a rectangular section in LSM.

8) Calculate the MOR & steel required for limiting rectn if width of beam is 300 mm, total depth is 700 mm & effective cover is 50mm. Use LSM. (area of)

9) A steel bar of 20mm dia of Fe415 grade is embedded in M25 concrete. Calculate its development length in tension & compression

10) A short column 300mm diameter is reinforced with 7nos of 16mm dia bars. Find the ultimate load carrying capacity of the column if the minm eccentricity is less than 0.05 times of diameter of the column. M15 and mild steel bars used.

11) A singly reinforced slab 120mm thick is supported by T-beam spaced 3m c/c. The effective depth of beam 580mm & width of web 450mm. Mild steel reinforcement 8bars of 20mm dia have been provided in tension 2 layers. The effective cover to steel bars in lower tier is 50mm. The effective span of simply supported beam is 3.6 m. The grade of concrete is M15. Determine the depth of N.A & the MR of T-beam.

12) A steel bar of 16mm dia of Fe415 grade is embedded in M20 concrete. Calculate its development length in tension & compression as well as anchorage value for a bend 90°.

13) A simply supported rectangular beam (250mm × 450mm) reinforced with 4 nos of 16mm dia bars as tension reinforcement is subjected to an all inclusive load of 20kN/m over a span of 3.5m. Design a suitable shear reinforcement. The materials are M20 & Fe415.

14) A doubly reinforced beam section 250mm wide & 450mm deep to the centre of the tensile reinforcement. It is reinforced with 2 bars of 16mm dia as tensile comp. reinforcement at an effective cover of 50mm & 4 bars of 25mm dia as tensile reinforcement. Assume M20 concrete & Fe415 steel. Calculate MOR of the beam section.

15) A RCC column of dimensions 250mm × 500mm is reinforced with 8 nos of 16mm dia bars equally distributed on all sides. Calculate & show the details of transverse reinforcement with the help of suitable sketches.

10 marks questions

1) Design a rectangular beam for an effective span of 6m. The superimposed load is 60KN/m and size of beam is limited 30cm × 60 cm overall. Use M20 mix and Fe 415 grade steel.

2) Design A simply supported beam with clear span 6m, width (b) = 400 mm, effective sp. depth (d) = 560 mm, carries a limit state load of 175 KN/m (including self weight, dead load & live load). It is reinforced with 4 bars of 28ϕ mm dia tension steel. which continue right into the support. Take fck = 20N/mm^2, fy = 250N/mm^2. Design shear reinforcement using LSM.

3) Determine the MOR of the beam. Given data: b_f = 1000 mm, Df = 100 mm, bw = 300 mm, cover = 50 mm, d = 450 mm & Ast = 1963 mm^2 (4-25 #). Use M20 & Fe 415.

4) A doubly reinforced beam section is 250mm wide & 500 mm deep to centre of tensile reinforcement. It is reinforced with 2-bars of 16mm dia as compression reinforcement at an effective cover of 50mm & 4 bars of 25mm dia as tensile steel. Calculate the ultimate MOR of the beam.

5) A simply supported one-way slab for an office building of a clear span 3m is supported over beams of 300mm width. Design the slab for a live load of 3KN/m^2. The materials used are M20 & Fe 415 steel (use LSM)

6) Design a square footing for a RCC column of 350mm × 350mm carrying a load of 500KN. The SBC of the soil is 120KN/m^2. Use M20 & Fe 415 for both column & footing.

7) Design

7) Design a doglegged staircase by LSM for a public build of ceiling height 3.5m. The width of each flight is to be kept 1.5m. Take rise as 160mm & tread as 250mm. Use M20 & Fe 415. Give a neat sketch.

8) A RC beam has an effective depth of 500mm & a breadth of 350mm. It contains 4-25mm bars. Calculate the shear reinforcement needed for a factored shear force of 350KN for M20 mix & Fe250 grade steel.

9) Design a short column, square in section, to carry an axial load of 2000kN using mild steel & M20

10) Design a short circular column to carry a helical reinforcement service load of 1600KN. Use lateral ties & helical reinforcement. The materials are M20 grade concrete & HYSD reinforcement of grade Fe500. Use LSM & draw reinforcement details.

11) A slab for the room 4m × 6m supported on 300mm thick brick wall on all four sides. The slab is simply supported at edges with no provisions to resist torsion at corners. Design the slab using M15 concrete & HYSD Fe-415 steel. Adopt LSM of design.

12) Design a cantilever slab to carry a live load of 3kN/m². The overhang of the slab is 1.25m. Use M20 concrete & Fe415 steel. Check for shear & deflection as per IS456. Draw neat sketch of reinforcement.

13) Determine the ultimate shear capacity of the section having size 230mm × 720mm effective depth reinforced with 5nos 16mm dia Fe415 grade bars (3 straight + 2 bent at 45°) with 8mm stirrups @ 375mm c/c. Use M20 grade concrete.

Part - A (Hydraulics)

1. HYDROSTATICS :-

1.1 Properties of fluid

2 marks :-

1) What is density?
2) What is sp. weight or wt. density?
3) Write down the relation between density & sp. weight.
4) Define viscosity & write down its unit.
5) Find out the kinematic viscosity of fluid if its dynamic viscosity is 1.14 N·s/m² & its sp. gravity is 1.9.
6) Calculate weight of 2.5 lt of mercury.
7) What do you mean by kinematics & dynamics?
8) What do you mean by surface tension of fluid?
9) Write down the unit of surface tension.
10) What do you mean by capillarity?
11) Write down the expression for capillary rise.
12) Write the expression for capillary fall.
13) What do you mean by ideal fluid?

5 Marks :-

1) Find what force is required to drag a thin plate of area 0.5 m² between two surface 2.5 m apart filled with liquid viscosity of 0.82×10^{-1} kg·s/m² at a velocity of 0.6 m/s. The position of plate is

i) 1 cm below the top surface

ii) 2 cm below the top surface.

2) A body weighing 441.5 N with a flat surface area 0.094 m² slides down lubricated inclined place making a 30° angle with the horizontal for viscosity 0.1 N·s/m² & body speed of 3 m/s. Determine lubricant film thickness.

3) Calculate the sp. wt., sp. volume & density of a liquid having volume of 6 m³ & weight 44 kN.

10 Marks :—

1) The space between two square flat parallel plates is filled with oil. Each side of plate is 720 mm. The thickness of oil film is 15 mm. The upper plate, which moves at 3 m/s requires a force of 120 N to maintain the speed. Determine i) the dynamic viscosity of oil ii) kinetic viscosity of oil if sp. gravity of oil is 0.95.

2) If the velocity distribution over a plate is given by $u = \frac{2}{3}y - y^2$ in which u is the velocity in m/s at a distance y meter above the plate, determine the shear stress at $y = 0$ & $y = 0.15$ m. Take dynamic viscosity of fluid as 8.63 poises.

1.2 Pressure & Its Measurement

2 marks :-

1) What is pressure?
2) State Pascal's law.
3) State Hydrostatic law.
4) What is absolute pressure?
5) What is gauge pressure?
6) What is vacuum pressure?

5 Marks :-

1) A U-tube differential gauge is attached to two sections A & B in a horizontal pipe in which oil of sp.gravity 0.8 is flowing. The deflection of mercury in the gauge is 60cm, the level nearer to A being the lower one. Calculate the diff. of pressure in kgf/cm² between section A & B.

2) An open tank contains water for a depth of 1.5m & above it oil of sp.gravity 0.8 for a depth of 0.75m. Find the pressure intensity.

   i) At the interface of two liquids.
   ii) At the bottom of tank.

3) A differential manometer connected at two point A & B at the same level in a pipe containing an oil of sp.gravity 0.8 shows a difference in mercury level as 110mm. Find the difference of pressure at A & B.

4) Find out the load at ram if the load at plunger is 500 N. The diameter at ram is 0.3 m & at plunger is 0.045 m.

1.3 Pressure Exerted on an Immersed Surface

2 Marks :-

1) What is total pressure?

2) What is center of pressure?

3) Write the formula for determining center of pressure & total pressure for vertical surface immersed in liquid.

4) Write the formula for determining center of pressure & total pressure for horizontal surface immersed in liquid.

5 Marks :-

1) Determine the total pressure on a circular plate of dia. 2.5m, which is placed vertically in water, in such a way that, the C.G of plate is 4m below the free surface of water. Find the position of center of pressure.

2) Derive expression for total pressure for a vertically immersed surface in liquid.

3) Derive expression for total pressure for a horizontally immersed surface in liquid.

4) A sq. plate of side 4m lies in a vertical plane. Determine the position of center of pressure & total pressure force on the square when its upper edge is 12m below the water surface.

3/ A triangular gate which has a base of 2m & altitude 2.5m lies in a vertical plane. The vertex of the gate is 1m below the surface in a tank which contains oil of sp. gravity 0.8. Find the force exerted by oil on the gate & position of center of pressure.

2.0 Kinematics of Fluid Flow

2.1 Basic Eqn. of fluid flow & their application:-

2 marks:-

1) what is rate of discharge?
2) State Bernoulli's Theorem.
3) what are the various practical applications of Bernoulli's Equation?
4) Write down Bernoullis Eqn. for real fluid.
5) what is Vena-Contracta?
6) what do you mean by Venturimeter? Write its discharge formula.
7) what is orifice meter? Write its discharge formula.
8) what is pitot tube?
9) Explain each term in Bernoulli's Equation.
10) write down assumptions of Bernoulli's Equation
11) what is continuity eqn.?

5 Marks :-

1. State Bernoulli's Eqn. & its application.
2. Write down the limitations of Bernoulli's Eqn.
3. What do you mean by venturimeter, orifice meter & pitot-tube?
4. Explain diff. types of energies of a liquid in motion.

10 Marks :-

1. A venturimeter with a 150mm dia. at inlet & 100mm at throat is laid with its axis horizontal & is used to measure the flow of oils sp. gravity 0.9. The oil mercury differential manometer shows a gauge difference of 200mm. Assume co-efficient of venturimeter is 0.98. Calculate discharge in lt/s.

2. A pitot-tube is inserted in a pipe of 300mm diameter. The static pressure in pipe is 100mm of mercury (vaccum). The stagnation pressure at center of pipe, recorded by pitot tube is $0.981 N/m^2$. Calculate the rate of flow of water through pipe, if the mean velocity of flow is 0.85 times the central velocity. Take c = 0.98.

3. An orifice meter with orifice dia. 20cm is inserted in pipe 40cm dia. The pressure gauge fitted upstream & downstream of orifice meter give readings of $14.715 N/cm^2$ & $9.81 N/cm^2$ respectively. Find rate of flow of water through the pipe lt/sec. Cd = 0.6

4) Find the discharge of water flowing through a pipe 30cm dia. placed in an inclined position where a venturi-meter is inserted having a throat dia. of 15cm. The diff. of pressure between the main & throat is measured by a liquid of sp. gr. 0.6 in an inverted U-tube which gives a reading of 30cm. The loss of head between the main & throat is 0.2 times the kinetic head of the pipe.

2.2 Flow Over Notches & Weirs

2 marks:-

1) What is Notch?
2) Write down the discharge formula for Rectangular notch.
3) Write the discharge formula for triangular Notch.
4) Write down the discharge formula for trapezoidal notch.
5) Write down the discharge formula for stepped notch.
6) What is weir?
7) Differentiate between notch & weir.
8) Why a triangular notch gives more accurate discharge in comparison to rectangular notch?

5 Marks:-

1) Write down the difference types of weir & notch?
2) What are the advantages of triangular notch over rectangular notch?

3> Find the discharge over a cipolletti weir of length 2m when head over the weir is 2m & velocity of approach is 1·5 m/s. Take $C_d = 0.62$

4> A rectangular notch is to be made to discharge 1800 lt/min with a head over the sill equal to 0·6m width of notch. Neglecting velocity of approach & allowing two ends contraction. Determine width of notch & head over sill.

5> A rectangular weir 6m long is divided into 3 bays at two vertical posts each 0·3m wide. Find the discharge when the head is 0·5m.

<u>2.3 Types of flow through pipes & 2.4 losses of head of a liquid flowing through pipes</u>

<u>2marks:-</u>

1> What is uniform flow?
2> What is non-uniform flow?
3> What is steady flow?
4> What is laminar flow?
5> What is turbulent flow?
6> What is unsteady flow?
7> What is Reynold's Number?
8> Write down Darcy Weisbach formula for loss of head due to friction.
9> What is Hydraulic Gradient line?
10> What is Total Energy line?

➤ Write down the applications of Reynolds Number.

10 Marks :-

1) A horizontal pipe of dia 200 mm, if suddenly enlarged to a dia. of 400 mm. The rate of flow of pipe is 250 lt/s. Find head loss.

2) A horizontal pipe line 40 m long is connected to a water tank at its one end & discharges freely into the atmosphere at other end. For the first 25 m of its length from the tank the pipe is 150 mm dia. & its diameter is suddenly enlarged to 300 mm. The ht. of water level in tank is 8 m above center of pipe. Consider all losses of head which occur, determine the rate of flow. $f = 0.01$ for both section of pipe.

3) A pipe carrying discharge 0.35 cumec has diameter of 40 cm & length 400 m, connects two reservoirs. Find the diff. in elevation between the water surfaces of two reservoir considering inlet loss, outlet loss & loss due to friction.

2.5 Flow Through Open Channel

2 Marks :-

➤ Write down Chezy's formula & Manning's formula for discharge.

➤ What is best economical section?

5 Marks :-

1) Write down the conditions for best economical section for trapezoidal & circular section.

2) Write down the condition for best economical section for rectangular section

3) A trapezoidal channel has side slope 1-horizontal to 2 vertical & slope of bed 1 in 2500. The area of section is 40 m² find the dimensions of most economical section & its discharge.

4) An irrigation canal 1.5 horizontal & 1vertical to carry 12 m³/s with a bed slope of 1 in 4800. The co-efficient of friction in Manning's formula is $n = 0.013$. Find the dimension of most economical canal section.

10 Marks :-

1) Determine the max. discharge of water through a circular channel of dia. 1.5m when the bed slope of channel is 1 in 1000. C = 60.

2) Find the slope of bed of rectangular channel of width 5m when depth of water is 2m & rate of flow is 20 m³/s. Take C = 50.

3) A trapezoidal channel has side slope of 1:2 & slope of bed is 1:1500. The area of section is 40m². Find the dimension of section, if it is most economical. Also determine the discharge. C = 15.

3.0 Pumps

2 Marks:-

1) Define slip in reciprocating pump.

2) What do you mean by cavitation of pump?

3) In what condition negative slip occur in reciprocating pump?

4) Why there is limit to the suction lift of centrifugal pump?

5) Define static head & manometric head for centrifugal pump.

5 Marks:-

1) Differentiate between centrifugal & reciprocating pump.

2) A single acting reciprocating pump runs 50 rpm discharges 3.5 Lt of liquid/sec. The dia. of bore is 15cm & stroke length 30cm raises water from a sump. Find the theoretical avg. discharge & slip.

3) A double acting reciprocating pump having piston area 0.1m² has stroke length 0.35 m long. The pump discharges 2.5 m³/min at 50 rpm through ht. of 9.8m. Find slip of pump & the power required to drive the pump.

4) With neat sketch explain the operation of reciprocating pump.

5) What is the diff. between single acting & double acting reciprocating pump?

6) Explain efficiencies of a centrifugal pump with mathe-matical formula.

10 Marks:-

1) Find the horse power of pump required to lift water at the rate of 80 LPS (lt/s) to a ht. of 20m if the overall efficiency is 65%.

2) Describe the main parts of a centrifugal pump with a detailed diagram.

3) A centrifugal pump with power of 24 kW delivers 220 lt/s. of water at a total head of 8m. Find out the overall efficiency.

4) A double acting reciprocating pump, running at 50 rpm is discharging 900 lt of water per minute. The pump has stroke of 400 mm. The diameter of piston is 250mm. The delivery & suction heads are 25m & 4m. Find the slip of pump & power required to drive the pump.

5) Describe working principle of reciprocating & centrifugal pump.

Part -B (Irrigation Engg)

2 marks :-

1) What is CCA?
2) What is intensity of irrigation?
3) What do you mean by run off?
4) What is hyetograph?
5) What is catchment area?
6) Write the flood discharge formula by Dicken & Ryve.
7) What is irrigation?
8) What do you mean by lift irrigation?
9) What is flow irrigation?
10) What is weir?
11) What is crop ratio?
12) What is crop rotation?
13) What is time factor?
14) What is base period?
15) What do you mean by Delta?
16) What do you understand by Duty?
17) Write down the relation between base period, duty & delta.
18) What is GCA?
19) What is field capacity?
20) What is permanent wilting point?
21) What do you mean by consumptive use of water?
22) What is overlap allowance?

23) What is hydrological cycle?

24) State two kharif crops of India.

25) What is perennial irrigation?

26) What is inundation irrigation?

27) Write down various sources of irrigation water.

28) What is berm?

29) What do you mean by free board?

30) What are the objectives of constructing free board in canals?

31) What do you mean by Kor-watering?

32) Find the delta for a crop when its due is 864 hectares/cumec on the field & base period of crop is 120 days.

33) What is Dowel or Dowla?

34) What is spoil Bank?

35) What do you mean by borrow pit?

36) What is canal lining?

37) What is water-logging?

38) What do you mean by canal head work?

39) What is the diff. between weir & barrage?

40) What is the diff. between scouring & sitting?

41) What do you mean by aqueduct?

42) What is syphon aqueduct?

43) What is super-passage?

44) What do you understand by syphon super-passage?

45) What is level-crossing?

46) What do you mean by inlet & outlet?

47) What do you mean by dam?

48) What is cross drainage work?

49) What is drainage gallery?

50) Define cash crop.

51) Classify canal according to their alignment.

52) What is spillway?

53) What is hydrograph?

5 Marks :—

1) Explain hydrological cycle?

2) Describe different types of precipitation?

3) Write down the necessity of irrigation.

4) Write down the benefits of irrigation

5) What is crop season? Write down diff. types of crop season.

6) Derive the relation between base period, duty & delta.

7) Write down the difference between inundation & perennial irrigation.

8) Draw the canal section partly in cutting & partly in filling.

9) Write down the objective of canal lining.

10) Write down causes of water-logging.

11) Write down the remedies of water-logging.

12) Write down the necessity of diversion head-work.

13) Give neat sketch of various canal cross-sections showing diff. parts of canal.

14) Give neat sketch of diversion head work showing diff. parts of it.

15) What is the difference between weir & barrage?

16) What is fall? Write the different types of canal fall & with neat sketch of one fall.

17) Write down the various causes of water logging.

18) Mention types of irrigation followed in India.

19) Write the difference between cross regulator & head regular.

20) Discuss briefly the factors on which duty depends.

21) Describe briefly the advantages of lining of irrigation canal.

22) Describe classification of canal according to their alignment.

23) Describe briefly the causes of failure in earthen dams.

24) The command area of a channel is 4000 hectares. The intensity of irrigation of a crop is 70%. The crop requires 60cm of water in 154 days, when the effective rainfall is recorded as 15cm during that period. Find out the duty at the head of fields.

25) Write down preventive measure for gravity dam.
26) What are the causes of failure of gravity dam?
27) Write down preventive measure for earthen dam

10 Marks :—

1) Explain briefly different types of rain-gauges.
2) Describe various types of canal lining with their advantages & disadvantages.
3) Write down the control measure of water-logging.
4) Explain briefly different components of diversion head work.
5) Explain with neat sketch the working principle of syphon aqueduct.
6) Write briefly types & function of spillway.
7) Explain with neat sketch the working pro of canal syphon.
8) Explain the effect of any two forces acting on a gravity dam for the stability of structure.
9) The GCA for a distributory is 6000 hectares, 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% & that for kharif season is 25%. If avg. duty at head of distributary is 2000 hectares/cumec for Rabi season & 900 hectares/cumec for kharif season. Find out the discharge required at the head of distributary from avg. demand consideration.

Survey-I (4th Sem)
Question Bank

2 marks Questions

1) What is the difference between well conditioned triangle and ill conditioned triangle?

2) Write down the adjustment of chain.

3) What is cadastral surveying?

4) What are the sources of error in chain surveying?

5) What is cardinal principle in surveying?

6) How ranging rods are different from offset rod?

7) Why well-conditioned triangles are preferred in chain surveying?

8) State the basic principle of chain surveying.

9) Why chains are preferred over tapes in chain surveying?

10) What are the sources of error in chain surveying?

11) What are the different types of survey.

12) Name different types of chains used in surveying.

13) Define isogonic and agonic lines.

14) What is local attraction and how it is detected?

15) What do you mean by compass surveying?

16) Define local attraction.

17) Define fore bearing and back bearing of a survey line.

18) The bearing of line AB and AE are $210°$ and $70°$ respectively. Calculate the interior angle A.

19) Convert following W.C.B into Q.B.

(i) $160° 25'$

(ii) $255° 30'$

(iii) $15° 45'$

(iv) $203° 30'$

20) Define true meridian and magnetic meridian.

21) How are ranging rods different from offset rods.

22) Draw conventional signs for cementary & pukka building.

23) Draw conventional symbols of church & railway crossing.

24) What is a field book? What kind of field book would you prefer and why?

25) Draw conventional symbols of chain line, Temple, building and boundary line.

26) Why optical square is used in surveying.

27) What is the principle of plane table survey?

28) Distinguish between suitability of radiation and intersection method.

29) What is the difference between triangulation and traversing?

30) Differentiate between open traverse & closed traverse.

31) Define grid reference and grid square.

32) What do you mean by cadastral map.

33) What is unique identification number of parcel.

34) Define line of collimation

35) What is deflection angle

36) Define level surface

37) Define transiting?

38) Why two verniers readings are taken?

39) Define height of instrument in levelling.

40) what is telescope normal?

41) Define lattitude and departeure of a survey line.

42) What is parallex

43) what is the least count of a theodolite.

44) what do you mean by fiducial edge of the alidade?

45) what is transiting?

46) State Simpson's rule.

47) what is the relationship between one hectare and acre.

48) what is trapezoidal rule?

5 marcks Questions

1) Explain the errores in chaining?

2) Explain how a chain is tested and adjusted in the field.

3) What is a chain? Explain the errores and mistakes in chaining?

4) Write short notes on:
   (i) Base line, (ii) Check line (iii) offset.
   (iv) Slope correction (v) leader and follower.

5) What are the obstacles in chaining. Explain any one of them.

6) Write down the types of chains and tapes used in surveying?

7) Describe briefly ranging across a high ground.

8) Explain the principle of line ranger & with a neat sketch.

9) A surveyor measured the distance between two points on plan drawn to a scale of 1cm = 40m and result was 460m. Later, however he found that he used a scale of 1cm = 20m. Find true distance between the points.

10) What is meant by folding & unfolding a chain?

11) Explain direct ranging & indirect ranging in chain survey.

12) The length of a survey line measured with a 30m chain was found to be 315.6 m. Afterward it was found that the chain was 8cm too long. What is the corrected length of the line?

13) Examine wheather a triangle having sides 156m, 103m and 256m is well conditioned or not?

14) Explain causes and remedies of compensating and cumulative errors.

15) What is a field book? How datas are entered in field book e what are the precautions to be taken while entering data.

16) The length of a line measured with a 30m chain was found to be 380m. The true length of the line was known to be 381.5m. Find the error in the chain.

17) Write down the comparision between chain surveying and compass surveying.

18) Write down the methods of compass traversing

19) What do you mean by precision and accuracy of measurements.

20) The magnetic bearing of a line AB is 125° 30'. Find out its true bearing if the magnetic declination at A is ~~true~~ ~~so~~ .
(i) 9° 30' W   (ii) 5° 30' E.

21) Draw a neat sketch of a prismatic compass & explain about diff. parts of it.

22) what is local attraction? How it is detected

23) Define W.C.B. & Q.B in compass survey

24) Explain various sources of errors in compass survey.

25) Convert following QB to WCB :—

Line		QB
AB	→	S 36° 30' W
BC	→	S 213° 30' E
CD	→	N 26° 45' E
DE	→	N 40° 15' W
EF	→	S 51° 20' W.

26) Find included angles between AB & AC if their WCB are
(i) AB 75° 30' & AC 108° 50'
(ii) AB 185° 50' & AC 269° 25'

27) Write short notes on :—
(i) Force bearing & back bearing
(ii) Magnetic declination
(iv) Plain surveying & geodetic surveying.

28) Enlist & explain the function of each of instruments required for plain table surveying

29) what is orientation. what are the methods of orientation. Explain one of them.

30) Explain the procedure for setting up plane table over a station.

31) Mention various errors & it's precautions in plain table surveying.

32) Explain principle of plain table surveying.

33) Describe the process of measuring vertical angle using theodolite

34) What is face left & face right observation in angular measurement by a theodolite & why it is necessary.

35) Describe briefly temporary adjustment of theodolite.

36) List out the fundamental lines of a transit theodolite.

37) Write Bowditch's rule for balancing a traverse.

38) Find length and bearing of the survey line AB. The coordinate of A are 100 (northing) & 200 (Easting) and of B are 100 (southing) & 300 (easting).

39) Define horizontal equivalent & contour interval.

40) Write down the characteristics of contour with neat sketch.

41) Find the length of & bearing of DA from following data :—

Line	Length	Bearing
AB	124 m	32°
BC	165 m	168°
CD	97 m	44°
DA	—	—

1) A line was measured with steel tape 30m long standardised at 20°c with a pull of 150N was used, the measured length being 1600m. The temperature at the time of measurement was 25°C and pull exerted was 170N. Find the true length of line if wt. of 1 cubic cm of steel is 0.08N, wt. of tape is 8N. The coefficient of expansion of the material per 1°C = 3.5 × 10⁻⁶ & modulus of elasticity is 2.1×10⁵ 2.5 × 10⁵ N/mm².

2) A survey line BAC crosses a river. A and C being the near and opposite banks respectively. A perpendicular AD 50m long is setout at A. If the bearings of AD and DC are 45°45' and 280°15' respectively, find the width of river.

3) Write short note on:
   i) Ranging (ii) Cross staff (iii) Optical square.

4) A 30m steel tape was standardised on a flat ground, at a temperature of 30°c & under a pull of 10Kg. The cross-sectional area of the tape is 0.30 cm² & its weight is 600g. The young's modulus & coefficient of linear expansion of steel are 2.1×10⁶ kg/cm² and 11×10⁻⁶/°c respectively. Find the correct horizontal distance.

5) Explain field procedure of chain survey?

6) How chains are superior to tape? Explain 5 diff. chains commonly used in field measurement.

#) Draw neat sketch of prismatic compass and label its various parts.

8) The bearings observed at the stations of a closed traverse are given below. Check whether the bearings are correct or not. If not, then correct it.

Line	FB	BB
AB	$122°\ 15'$	$302°\ 15'$
BC	$66°\ 06'$	$243°\ 45'$
CD	$305°\ 15'$	$133°\ 00'$
DA	$198°\ 00'$	$15°\ 30'$.

9) Following are FB & BB of the sides of a closed traverse. Find out the included angles :—

Side	FB	BB
AB	$150°\ 15'$	$330°\ 15'$
BC	$20°\ 30'$	$200°\ 30'$
CD	$295°\ 45'$	$115°\ 45'$
DE	$218°$	$38°$
EA	$120°\ 30'$	$300°\ 30'$

10) Following are the observed bearings of the One of a traverse ABCDEA. with a compass in a place where local attraction was suspected.

Line	FB	BB
AB	$191°\ 53'$	$13°$
BC	$39°\ 30'$	$222°\ 30'$
CD	$22°\ 15'$	$220°\ 30'$
DE	$242°\ 45'$	$62°\ 45'$
EA	$330°\ 15'$	$147°\ 45'$.

11) Write down various methods of plotting of compass traverse. If any error error occurs in plotting, how it is adjusted.

12) What is two point & three point problem & explain with neat sketches & procedures for solving above problems.

13) Describe the procedure of setting up plane table over a station.

14) Write short notes on radiation and traversing method in plane table surveying.

15) Explain orientation method of plane table surveying.

16) Describe process of repetition & reiteration by using theodolite.

17) Describe temporary adjustment of dumpy level

18) Following reading were taken in sequence during levelling work :-

Line		Latitude		Departure
AB	→	+225.5	→	+120.5
BC	→	-245.0	→	+240.0
CD	→	-180.5	→	-140.5
DA	→	+200.00	→	-220.0.

19) Find the area of closed traverse by calculation of area by co-ordinate method.

Side		Latitude	Departure
AB	→	+225.5	+120.5
BC	→	-245.05	+210.0
CD	→	-950.5	-110.5
DA	→	+170.0	-220.0.

20) The following readings are successively taken with an instrument in levelling work.

0.355, 0.485, 0.620, 1.755, 1.895, 2.850, 1.780, 0.345, 0.685, 1.230.

The position of the instrument was changed after taking 4th & 7th reading.

Prepare a page of level field book and calculate the R.L. of all points, if RL of the 1st point is 85.00m. Also apply necessary checks.

21) Latitudes and departures of lines of a closed traverse ABCD are as follows:

Line	Latitude		Departure	
	N.	S.	E.	W
AB	200.8	—	110.5	—
BC	—	230.2	220.9	—
CD	—	150.7	—	88.4
DA	180.2	—	—	243.0

Calculate the area of traverse by Latitude & DMD method. The sides are measured in m.

22) Reciprocal levels were taken with a dumpy level & following observations were recorded.

Inst. station	Staff held at	
	A	B
A	1.235	1.385
B	0.950	0.600

RL of station A is known to be 625.15m.
Calculate RL of B.

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23) Following offsets were taken from a chain line to an irregular boundary line at an interval of 10m:-

0, 2.50, 3.50, 5, 4.60, 3.20, 0 m

Calculate the area between the chain line, the irregular boundary line & the end offset by

(i) Mid-ordinate rule

(ii) Simpson's rule

(iii) Trapezoidal rule

(iv) Average-ordinate rule

24) Following offsets were taken from a chain line to edge :-

Distance (m)	0	10	20	30	40	60	80	100	120	140
Offset (m)	0	2	2.5	2.2	3	3.4	2.8	2.6	3.2	2.9

160
2.7

Calculate area enclosed by Simpson's rule

25) State and explain with sketches the trapezoidal rule, Simpson rule and ordinate rule. What are the limitations of Simpson's rule and trapezoidal rule.

Questions for 2 marks

→ Mention the name of the two cities of Orissa through which NH5 passes.

→ Why Indian Road congress was formed?

→ What is MDR and where it is provided?

→ Define camber with sketch

→ Name the portion of roadway, that is used by the pedestrans?

→ Name the type of highway which connects various ports, foreign highways, capitals of various states.

→ What should be the formation width of National Highway in plain area as per IRC recommendations?

→ Write the name of the equipment which is used in aggregate crushing strength test.

→ What do you mean by surfacing?

→ Define california bearing ratio.

→ Name the ancient road built by Roman and mention one feature of such road.

→ Mention two points basing on which the highway is classified.

→ What is building line in a road alignment?

→ Where superelevation is provided in a road alignment?

→ Why are curves provided on Roads?

→ What do you mean by soil stabilisation? Name any two techniques of soil stabilization?

→ Mention why Highway planning surveys are required.

→ Name the different tests conducted for road aggregates.

→ Give the names of plant and equipment required in Highway construction.

→ Name the authority that looks after the widening of present NH system under golden quadrangle project.

→ Differentiate between camber & gradient.

→ How a topographic map is designated?

→ Distinguish between subgrade & subbase in a road pavement.

→ What is the function of brest wall in hill roads?

→ Mention any two reasons of providing road drainage.

→ Write any two types of failure in rigid pavement.

→ What is the function of equipments:

    (a) Dragline &

    (b) Road paver

→ Enumerate different types of traffic signal.

→ What do you mean by 'MDR' and 'SH'

→ What is 'cross slope'?

→ What do you mean by 'carriage way'?

→ What is kerb?

→ What is the IRC recommended value of ruling gradient in plain terrain?

→ Name the portion of the roadway that is used by the pedestrains.

→ Why do you do the abrasion test for road aggregates?

→ What is 'flakiness index' of road aggregates? What is its significance?

→ What do you mean by the term 'subgrade'?

→ What are the functions of CRRI in India?

→ Why traffic separators are provided in a roadway?

→ What is express highway?

→ What do you mean by passing sight distance?

→ Enumerate different types of traffic signals.

→ Write any two types of failure in flexible pavement.

→ Define impact value of aggregate.

→ What is the purpose of wearing course in a road pavement?

→ Write down the ways camber are provided.

→ What is the necessity of highway planning?

→ Define right of way

→ State the IRC specifications for width of carriage way for various classes of roads.

→ Define retaining wall & brest wall?

→ What are the various surveys to be carried out before planning a highway system for a given area?

→ Why camber is provided in the roads?

→ What are the objectives of sub-surface drainage of road aggregates?

→ Draw a general shapes of different types of transition curves.

→ Differentiate premix carpet & semidense carpet.

→ What do you mean by Road Pavers & Bulldozer?

→ What do you mean by soundness test?

→ Define cement stabilization.

→ Why retaining walls are provided in hill roads?

→ What are the functions of Indian road congress?

→ What is superelevation or cant?

→ What is WBM, define

→ Define fly ash stabilisation.

→ What do you mean by CBR test?

→ Explain water absorption test.

→ Define lime stabilization.

→ Name important transportation organisations.

Questions for 5 Marks

→ Draw the typical cross-sections of NH in cutting indicating the width of pavement, roadway and land.

→ Explain with sketches how the obligatory points control the Highway alignment.

→ Describe briefly the procedure for carrying out the aggregate impact test.

→ calculate the stopping sight distance for speed of 65 kmph for two-way traffic on a two lane road. Given that, co-efficient of friction = 0.36. Total reaction time = 2.5 seconds

→ what are the materials required in the construction of water Bound Macadam road. Mention its advantages & disadvantages.

→ write short notes on (any two) of the following :
  (i) Grouting
  (ii) Non-passing sight distance
  (iii) Hair pin bends

→ Give a brief account of IRC classification of roads.

→ Define CBR and its significance in evaluating pavement layers.

→ Draw a typical cross-section in cutting on a straight alignment of road for double lane.

→ calculate the max^n allowable speed on a horizontal curve of radius 450 m if the limiting values of lateral co-efficient of friction is 0.15 and the rate of super-elevation is 0.07

→ what are the basic considerations for road construction in hilly areas ?

→ Briefly explain the requirements of road aggregates as per IS specifications.

→ what do you mean by soil stabilization & how mechanical stabilisation is done ?

→ write short notes on any two :
  (i) Tipper & Bulldozer
  (ii) Road Pavers & dumpers
  (iii) Rollers   (iv) Los Angle's Abrasion value

→ write down the various functions of 'central Road Research Institute'.

→ Design the rate of superelevation for a horizontal highway curve of radius 450 m & speed 90 kmph.

→ Draw a typical cross-section of a road in cutting.

→ what are the requirements of good road aggregates ?

→ what are the basic differences between a rigid pavement and a flexible pavement ?

→ what is the necessity of retaining wall in hill roads ?

→ Give a brief description of patch repairing process.

→ calculate the superelevation required for a road of 7.2m wide on a curve of 240 m radius for a permissible speed of 80 kmph. The coefficient of friction is 0.15

→ Draw a typical c/s of a highway in filling.

→ what are the basic difference between a rigid pavement and a flexible pavement ?

→ what do you mean by superelevation ? Derive the formula and find the rate of superelevation for a horizontal curve of radius 500m & speed 100 kmph.

→ what are the methods used for maintenance of bituminous road ? write each in brief.

→ How can you control the erosion of roadside slopes ?

→ write down the causes & preventions of landslides in hill roads.

→ what are the significant recommendations of Jayakar committee report ?

→ Explain total reaction time of the driver.

→ Define camber. What are the objectives of providing camber ? specify the recommended ranges of camber for different types of pavement surfaces.

→ Explain CBR test.

→ Mention the steps for the preparation of subgrade.

→ Mention the types of equipments used for excavation & compaction of soil for embankment.

→ Discuss the second twenty year road plan & its salient features.

→ Derive an expression to find out the stopping sight distance at a level surface.

→ What is overtaking sight distance? Derive an expression for calculating the overtaking sight distance on a highway.

→ Enlist the various tests on road aggregates. Distinguish between aggregate impact test & Los Angeles Abrasion test.

→ What are the various components of surface drainage system? Explain briefly.

→ Explain soil lime stabilization process & its suitability.

→ Draw a typical c/s of a rigid pavement road in NH and mention the layers of road from the base.

→ Draw the following (Each 5 Nos.)
  (i) Regulatory signs
  (ii) Warning sign

→ Write short notes on
  (i) D.L.C   (iii) D.B.M   (v) W.B.M
  (ii) P.Q.C   (iv) B.C

→ State the causes of failure of Flexible pavements with neat Sketch.

→ A vehicle travelling at 60 kmph was stopped within 2.8 seconds after the application of the brakes. Determine the average skid resistance.

→ classify traffic islands with neat sketches.

→ Describe with neat diagram & explain the different types of flexible pavements.

→ calculate the passing sight distance for a two-way traffic highway for which the design speed of 60 kmph. The rate of acceleration of the fast moving vehicle may be assumed as 3.6 kmph/second and the difference in speed between the overtaking vehicle & the overtaken vehicle as 20 kmph. what will be the passing sight distance if only one-way traffic is allowed.

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→ Design the rate of superelevation for a horizontal highway curve radius 750 m and speed 110 kmph.

→ Explain in detail lime stabilization.

→ classify & explain traffic signals.

→ Describe the following Tests on aggregates
   (i) water absorption test
   (ii) crushing strength test
   (iii) Impact test

→ Determine the absolute minimum radius & ruling minimum radius for minimum values of super-elevation of horizontal curve for a design speed of 50 kmph.

→ Draw the flow diagram for the planning & Surface specification dressing.

→ write short notes on
   (i) power shovel   (ii) Dredgers

→ Discuss the maintenance procedures of cement concrete roads.

→ Define gradients. Describe different types of gradients.

→ Explain briefly sub-surface & surface drainage system in highways with sketches.

→ Discuss briefly sub-surface and surface drainage system in highways with sketches.

→ Describe the functions of various pavement components.

→ calculate the minimum non-passing sight distance on a highway at a descending gradient of 6%.
   Given the following data :
   (i) Design speed = 80 kmph
   (ii) Reaction time of driver = 2.5 seconds
   (iii) co-efficient of friction between tyre & road surface = 0.4

→ calculate the superelevation required for a concrete road 7.5 m wide on a curve of 800 m radius of a design speed of 50 kmph.

→ Describe cement stabilization in detail with factors affecting soil cement properties.

→ Describe with neat diagram explain the different types of flexible pavements.

→ Calculate the passing sight distance for a two-way traffic highway for which the design speed of 60 kmph. The rate of acceleration of the fast moving vehicle may be assumed as 3.6 kmph/second and the difference in speed between the overtaking vehicle & overtaken vehicle as 20 kmph. What will be the passing sight distance if only one-way traffic is allowed?

→ Design the rate of super elevation for a horizontal highway curve radius 750m & speed 110 kmph.

→ Explain in detail lime stabilization.

→ Define gradients. Describe different types of gradients.

Question for 7/10 Marks

→ calculate the superelevation required for a road 7.2m wide on a curve of 240m radius for a permissible speed of 30 kmph. The coefficient of friction is 0.15

→ Give valuable suggestions for maintenance of berms, side slopes, pavement edges and drainage works.

→ Give a neat sketch of sub-soil drainage for lowering the water table.

→ what are the methods of counting the vehicles and write notes on each method.

→ Explain obligatory points and discuss how these control the alignment with neat sketches.

→ show with sketches the four component parts of the road structure and represent width of pavement, kerbs, Traffic separators, shoulders, Road margins, Building line, Control line, footpath.

→ what are the various steps in the construction of cement concrete pavement ?

→ Discuss briefly about various flexible pavement failures and its remedies.

→ write short notes on :

(i) Camber and cant

(ii) stopping sight Distance (SSD) and overtaking sight Distance (OSD)

(iii) Flexible pavement and Rigid pavement

(iv) Draw non-dimensional neat sketch for the following traffic signs

 (1) No parking

 (2) Pedestrian crossing.

→ Briefly explain the different types of surfacings used in bituminous pavements and suitability of their use in different situations.

(i) Discuss briefly the factors to be considered for alignment of a road through urban areas.

(ii) What is meant by super-elevation and why is it considered essential for modern traffic?

→ Calculate the safe stopping sight distance for design speed of 60 kmph for
(a) two-way traffic on a two lane road
(b) two-way traffic on a single lane road.

Assume coefficient of friction as 0.4 and reaction time of driver as 2.5 seconds.

→ Explain with neat sketches of sub surface drainage for lowering of water table.

→ Write down the various types of joints in cement concrete pavement. Explain in detail the construction procedure of any one of the joints with neat sketch.

→ What do you mean by overtaking sight distance? Derive the expression for overtaking sight distance for one lane two-way highway.

→ Describe in brief, different types of route survey carried out to fix up road alignment.

→ Explain different types of surfacing used in bituminous pavements and suitability of their use in different situations.

→ Write the necessity of road drainage. Explain with sketch how the effectiveness of different drainage systems are achieved.

→ Classify roads as per third 20-year road development plan 1981-2001

→ Calculate the stopping sight distance for a design speed of 100 kmph. Take the total reaction time 2.5 second and the co-efficient of friction 0.35

→ Define superelevation. Design the superelevation required at a horizontal curve of radius 250 m for design speed of 100 kmph. Should there be restriction in speed?

→ What is overtaking sight distance? The speeds of overtaking & overtaken vehicles are 70 and 40 kmph, respectively on a two-way traffic road. If the acceleration of overtaking vehicle is 0.99 m/sec²

(i) calculate safe overtaking sight distance

(ii) Mention the minimum length of overtaking zone.

→ write short notes on:
(i) Water Bound Macadam (WBM)
(ii) Bituminous Concrete
(iii) Bituminous surface Dressing
(iv) Premixed carpet

→ what is surface drainage? Explain briefly surface drainage system with figures.

→ classify traffic signs with neat sketches show some of the important types of regulatory traffic signs and mention the functions of each.

→ Explain the total reaction time of driver.

→ (i) what is superelevation?

(ii) A highway is provided with a horizontal curve of radius 300m in certain locality.
Calculate the superelevation needed to maintain the design speed of 90 km/hr. Take coefficient of friction = 0.15

→ what are various equipments used for earthwork excavation and compaction of soil during highway construction? Give a comparative account of different options available.

→ write about the various problems while planning hill roads.

→ calculate the SSD on a highway at a descending gradient of 2·35%, for a design speed of 65 kmph. Assume other data as per IRC recommendation.

→ Explain briefly with neat sketch of CBR test.

→ Design the rate of superelevation for a horizontal highway curve radius 750m and speed 110 kmph.

→ write short notes on:
(i) Mechanical stabilization
(ii) Lime stabilization
(iii) cement stabilization
(iv) Fly ash stabilization

→ Explain briefly sub-surface and surface drainage system in highways with sketches.

→ Explain the working procedure with a neat sketchmetic plan view of a "Hot Mix plant" used for production of D.B.M & B.C

→ Draw a Flow chart of organisation of state Highway Construction Department and specify their duties and responsibilities.

→ what do you mean by stopping sight distance? Also give detailed analysis.

→ Explain the design of vertical curves.

→ Explain briefly with neat sketch of CBR Test.

→ with neat sketch discuss the different traffic signs.

→ what do you mean by passing sight distance? Also give a detailed analysis.

→ Explain the construction procedures of embankment.

→ with a neat sketch, describe methods of providing super-elevation.

→ Describe Bituminous macadam.

→ Describe water bound macadam.

→ with a neat sketch, describe methods of providing superelevation.

→ Discuss the different rigid pavement deficiencies.

→ what is the necessity of Embankment? Discuss the different characteristics

→ with neat sketch explain the different equipments used for subgrade preparation.

→ Describe the different compact equipments.

→ Describe abrasion test.

→ Describe the different types of transition curves.

→ Explain the design of vertical curves.