DESIGN OF STRUCTURES-II (RCC) CED351

Unit –I : Introduction

1. Limit state method and working stress method
2. Why is it necessary to control deflection?
3. What are the various types of deflection?
4. What are the types of deflection? Explain in detail
5. Write short term & long term deflection.
6. Classification of cracks
7. What is cracking? How are the cracks classified?
8. Explain the different types of crack
9. What is mean by cracking? Explain the types of cracks
10. What is redistribution of moment?
11. What is redistribution of moments and what are the IS requirements for it.

Unit –II : R.C. Section In Flexure

Explain the following terms **[02 Marks each]**

1. Effective span
2. Singly reinforced beams
3. Doubly reinforced beams
4. Under reinforced section
5. Over reinforced section
6. Balance reinforced section
7. Flanged section

General descriptive answers **[02 to 04 Marks each]**

1. Necessity of under reinforced section
2. Necessity of using steel in compression region
3. Different cases encountered in the flanged section
4. Explain the necessity of doubly reinforced section.
5. Explain with sketch the effective width of the flange
6. Derive from first principle the values of design parameters Kumax, Rumax, Ptmax for M23 and Fe550.
7. Derive from first principle, the values of design parameters (constants)Kumax, Rumax, ptmax. For a balanced section of concrete of grade M25 and steel grade Fe 415.
8. Derive from first principle, the values of design parameters (constants) Kumax, Rumax and pt_{max} for a balance section of concrete grade M20 and steel grade Fe 500
9. Find the area of steel for a beam 300 x600 (effective) subjected to the moment of 213.33 KNm, using M20 & Fe250.

Sample Numerical **[10 to 15 Marks each]**

1. A beam 250 MM X 550mm effective is subjected to a factored bending moment 300KN-m. Determine the area of doubly reinforced beam. Use M20 concrete and Fe 250 grade of steel. Assume effective covers for both sides as 50mm.

2. An R.C.C beam 200MM □ 400MM (effective) is reinforced with 3 bars of 16MM □ bars of Fe415 steel. Find the ultimate uniformly distributed load which the beam can carry safely over a span of 5M. Take M20 grade of concrete.

3. A beam 250MM□ 560MM effective is subjected to a factoredbending moment 310KN. Determine the area of steel for doubly reinforced section. Use M20 concrete and Fe250 steel. Assume d'=60MM

4. A R.C.C beam of rectangular section 230mm□ 400mm width an effective cover 40mm. find the maximum imposed uniformly distributed load carrying capacity of beam if it is simply supposed over a span of 3.5m. Use M20 and Fe415 grades.
5. Design a rectangular beam 230mm wide & 600mm deep with an effective span is 5m. The superimposed load on the beam is 45KN/m. use M20 and Fe415 grades. Assume the effective cove is 50mm
6. An isolated simply supported T-beam has a flange width of 2300mm and flange thickness of 120mm. the effective span of the beam is 3.5m. The effective depth of the beam is 580mm and its width 300mm. The beam having the reinforcement with 8-20mm diameter. Use M20 and FE415 grades. Determine the moment of resistance of the section.
7. Design the T-beam having 8M clear span, simply supported on wall 230MM wide, is subjected to a dead load of 23KN/M and a live load of 25KN/M. the width of flange = 1300MM, overall depth of beam = 550MM. depth of beam is 110MM and width of web = 350MM. use M20& Fe415 grades
8. A floor consists of 150mm thick slab monolithically constructed with 300mm wide beams spaced at 3.6m center to center. The effective span of beam is 5m. The slab is subjected to live load of 4.5 KN/m2. Design an intermediate beam. Use M20 & Fe415.
9. A T beam consists of a flange 1200□ 110mm. the depth of the beam is 600mm up to the centre of steel and width of web is 300mm. calculate the ultimate M.R of a T-beam, if area of tensile reinforcement is 2900mm2. Use M20 and Fe500 grades.

Unit –III: Design of beams for shear, bond and torsion

Explain the following terms. [02 Marks each]

1	Modes of failure
2	Shear reinforcement
3	Nominal shear reinforcement
4	Minimum shear reinforcement
5	Design shear reinforcement
6	Bent up bars
7	Types of bond
8	Local bond
9	Curtailment of bars
10	Torsional reinforcement

General descriptive answer [02 to 04 Marks each]

1. Explain Stress block parameter for shear.
2. Write short notes on Zoning in shear design.
3. What are the various types of shear failure in R.C. section? Explain in detail.
4. Why is the provision of minimum shear reinforcement compulsory in reinforced concrete beam?
5. Explain with sketches the diagonal Tension.
6. What is the bond in R.C.C? Derive the relation for flexural bond.
7. Explain Development length and necessity of the check.
8. Explain Anchorage bond and development length in detail.
9. Discuss the factors affecting bond between steel and concrete.
10. Discuss behaviour of a R.C beam under pure torsion.

Some sample Numerical problems [10 to 15 Marks each]

1. Design a shear reinforcement for a beam with 300mm wide and 650 mm effective depth. The beam is subjected to a shear of 250 KN. Use M30 and Fe 415 grades and percentage of steel is 1.6%.

2. A simply supported beam 300 mm x 600 mm (effective) is reinforced with 5-25 mm Ø. It carries a UDL of 80 KN/m over an effective span of 6m. Out of 5 bars, two bars can be bent up. Design the shear reinforcement. Use M_{20} & Fe_{415}.

3. An R.C beam 350MM wide and 500MM effective depth is reinforced with 4 bars of 25mm diameter. It is having a u. d. l of 75KN/M. over a span of 7.0m. Design the shear reinforcement using vertical stirrups and bent up bars. Use M20 and Fe415 grades.

4. A simply supported R.C beam, 380 mm wide and 750 mm deep carries a udl of 84 KN/m(including self weight) over an effective span of 6m. The beam is reinforced with 6-22 mm Ø bars of gradeFe500 on tension face. Design the shear reinforcement.
   a) Using vertical stirrups only and no curtailment of bars,
   b) Using bent up bars.

   Assume concrete of grade M20, effective cover = 50mm, load factor = 1.5 and width of support is 380 mm

UNIT –IV: Design of Slab and Staircase

Explain the following terms [02 Marks each]

1. Modification factor
2. Restrained slab and unrestrained slab

3. Components of staircase
4. Write minimum percentage of reinforcement required in beams & slabs for crack control.

General descriptive answer [02 to 04 Marks each]

1. Function of distribution steel in slab
2. Difference between one-way slab & two way slab
3. Necessity of torsion reinforcement in the slab
4. Explain torsional steel in Two ways slab
5. Write short notes on serviceability requirements of one-way slab design.

Some sample Numerical problems [10 to 15 Marks each]

1. Design a slab for a hall of size 4.5m x 6.5m . Slab is simply supported on all four edges; the corner is held down and carries a superimposed load of 4 KN/m^2. Use M_{20} & Fe415 grades. Also draw the neat sketches showing the reinforcement.

2. Design a reinforcement concrete slab for a room 4m x6.5m supported on a beam of width 250mm. The slab is continuous over all supports, carrying a live load of 4 KN/m^2 & floor finish is 0.9KN/m^2. Assume mild exposure condition. Take M20& Fe415 grades.

3. Design a reinforced concrete slab for a room of clear dimensions 4m X 5m. The slab is supported on walls of width 280mm. The slab is carrying a live load 4 KN/m^2 & floor finish 0.8 KN/m^2. Use M20 and Fe415 grades. The corners of slab are held down.

4. Design a reinforced concrete slab for a hall measuring 8m x 16m. The slab is supported on RCC beams 250 wide and spaced at 4.0m c/c. The live load is 5KN/m2. Use M20& Fe415.

5. Design a lintel over a 2.0m wide opening located centrally in a 300mm thick wall. The height of the masonry wall above the lintel is 3m. Take unit weight of masonry as 19KN/m^3. Use M20& Fe415

6. A space available in the residential building for a staircase in 4.1m x 3.2m in which doglegged stair is to be accommodated. The floor to floor height is 3.8m plan & designs the staircase.

7. Design a dog legged stair-case for a residential building having a room size 5m X 2.2m. Floor to floor height is 3m. The column size 230mm X 380mm. Take live load 3 KN/m^2 & floor finish 1 KN/m^2. Use M20 and Fe415 grades.

8. Design a dog-legged staircase with the following data.

a) Size of room = 2m X 4m
b) Column size = 230mm X 380mm
c) Floor to floor height = 3m
d) Live load = 3KN/m^2.
e) Floor finish= 1KN/m^2.

Use M20 concrete & Fe415 steel.

9. Design a dog-legged staircase for an office building in a room measuring 3.0x6.0 m (clear dim^n) floor to floor height is 3.0 m. It is supported on brick wall of 230mm thick. Use M20& Fe415. Show the reinforcement details

UNIT –V: DESIGN OF COLUMN AND FOOTING

Explain the following terms **[02 Marks each]**

1. Slenderness ratio.
2. Classification of columns.
3. Transverse reinforcement.
4. Pitch of helical reinforcement.
5. One-way shear and two-way shear
6. Minimum eccentricity.
7. Unsupported length of the column
8. Function of lateral ties
9. Critical sections for shear in footing
10. I.S specifications for reinforcement in compression member
11. Relationship for the load carrying capacity of an axially loaded short column.
12. Unsupported length and bucking load in connection with column

General descriptive answer **[02 to 04 Marks each]**

1. Explain the difference between short column & long column
2. Write functions of longitudinal & transverse reinforcement in R.C.C column
3. Explain in detail the Pu-Mu interaction diagram.

Numerical problems **[10 to 15 Marks each]**

1. Rectangular columns of section is reinforced with 8 bars of 25mm & determine the load carrying capacity of column taking min eccentricity less than 0.05 times lateral dimensions. Use M20 and Fe 415 grades

2. Design a column of size 450 x 600 mm and having 3 m unsupported length. The column is subjected to a load of 2000 KN and is effectively held in position but not restrained against rotation.

3. Design a short R.C.C column to carry an axial load of 1600KN. It is 4m long effectively held in position & restrained against rotation at both ends. Use M20 concrete & Fe415 steel.

4. Design a circular column of diameter 400MM subjected to a lo0ad of 1250KN. The column is having a spiral ties. The column is 3M long & effectively held in position at both ends but not restrained against rotation. Take M20& Fe415 grades.

5. Design an isolated rectangular R.C.C. footing for a column of size carrying an axial load of 80 KN. Assume S.B.C. is . Use M20 & Fe415 grades. Draw the neat sketch showing all the necessary details of reinforcement.

6. Design a footing for a column of 400 x 500 mm. the safe bearing capacity of soil is 190 KN/M2. Load on column is 850 KN. Use M20& Fe415.

7. Design an isolated footing for a square column 450MM□ 450MM reinforcement with 8 bars of 25MM dia. And carrying a load of 2000KN S.B.C of soil is 300KN/M2 at a depth of 1.5M below ground. Assume M20 grade of concrete & Fe415 grade of steel. Show the detailed reinforcement

8. Design an isolated square footing to carry a load of 1100KN from column. The columns having 230mm□ 450mm. S.B.C of soil is 280KN/m2. Use M20 grade of concrete & Fe 415 grade of steel. Show the detail reinforcements.

UNIT –VI : INTRODUCTION TO EARTHQUAKE ENGINEERING

Explain the following terms **[02 Marks each]**

1. Base isolation.
2. Earthquake force.
3. Earthquake ductile detailing.

General descriptive answer **[02 to 04 Marks each]**

1. Practically what precautions are taken to make a R.C.C. building more earthquake resistance?
2. State the guidelines for shear design as per the codes available for seismic design.
3. Explain importance of ductility in seismic design. Also write the names of IS code available related to earthquake.
4. Explain equivalent static lateral earthquake force.
5. State the guideline for earthquake ductile detailing as per IS 13920.

Geotechnical Engineering (CED353)

Unit I

1. Define void ratio and porosity and explain the relationship between them
2. Prove that: e = WG/Sr
3. A soil sample has a porosity of 40percent. The specific gravity of solids is 2.70. Calculate void ratio, dry density, unit weight if the soil is 50% saturated and unit weight if the soil is completely saturated.
4. Derive the relation between e, G, W, and Sr. with a neat sketch.
5. Define: Void ratio, Porosity, Relative Density, Moisture Content
6. Define: Degree of saturation, specific gravity, Effective pressure, Pore pressure
7. Define plastic limit. Explain the procedure of plastic limit with the help of a neat sketch
8. An undisturbed sample of soil has a volume of 100cm^3 and mass of 190 gm. on oven drying for 24 hours the mass is reduced to 160 gm. if the specific gravity of grains is 2.68, determine the water content ,void ratio and degree of saturation.
9. The mass specific gravity of a soil equals 1.64.The specific gravity of solids is 2.70. Determine the void ratio under the assumptions that the soil is perfectly dry. What would be the void ratio, if the sample is assumed to have a water content of 8 percent?
10. Define liquid limit. Explain the procedure of liquid limit with the help of a neat sketch
11. Explain the term swelling, sensitivity, thixotropy.
12. Explain the procedure of determination of specific gravity by pycnometer method
13. Prove that: Yd= GYw/1+e
14. Explain the procedure of determination of field density by sand replacement method.
15. Explain pipette method used for sedimentation analysis

Unit II

1. Define permeability and Darcy's law .Derive the relation between seepage velocity and discharge velocity
2. Explain High way Research Board Classification
3. Explain with the help of sketch Textural classification of soil
4. Explain constant head permeability test with neat sketch
5. Write a note on Highway research board classification
6. Explain particle size classification
7. What are the properties of flow net?
8. Explain plasticity chart with the help of a neat sketch
9. Derive the equation for falling head method with a neat sketch
10. Explain Permeability of a stratified soil deposit with a sketch
11. Write a note on soil structure with a neat sketch

Unit III

1. Define compaction. State the factors affecting compaction
2. Differentiate between standard proctor test and modified proctor test
3. A laboratory compaction test on soil has a specific gravity equal to 2.68 gave a maximum dry density of 1.82 gm/cm^3 and a water content 17 percent. Determine the degree of saturation, air content, and percentage air voids at the maximum dry

density. What would be the theoretical maximum dry density corresponding to zero air void at the optimum water content.

4. Explain the procedure of standard proctor test
5. Write a note on Field method of compaction control
6. Define consolidation .state the assumptions made in one dimensional consolidation theory.
7. Explain the laboratory consolidation test with a sketch.
8. State the assumptions made in one dimensional consolidation theory. Derive the equation for one dimensional consolidation theory
9. Explain square root of time fitting method with a sketch.
10. Explain logarithm of time fitting method with a neat sketch
11. Derive the Laplace equation for two dimensional flow

Unit IV

1. What are the assumptions in Boussinesq Equation?
2. Derive the Boussinesq's equation for point load with a sketch
3. Derive the equation for vertical pressure under a uniformly loaded rectangular area with a sketch.
4. Derive the equation for vertical pressure under a uniformly loaded circular area with a neat sketch
5. Explain new mark's influence chart with a sketch and method for uniformly distributed loads
6. Prove that the maximum vertical stress on a vertical line at a constant radial distance r from the axis of a vertical load induced at the point of interaction of the vertical line with a radial line at $\beta = 39$ degrees and 15 minutes

Unit V

1. Explain Mohr's stress circle, theoretical considerations
2. Write a note on Mohr –coulomb failure theory
3. Explain direct shear test with a neat sketch
4. Explain tri-axial test with a neat sketch
5. Write a note on Vane shear test
6. Explain unconfined compression test
7. A cylinder of soil fails under an axial vertical stress of $100kN/m^2$, when it is laterally unconfined. The failure plane makes an angle of 50 degrees with the horizontal. Calculate the value of cohesion and the angle of internal friction of the soil.
8. A cylindrical specimen of saturated clay,4 cm in diameter and 9cm in overall length is tested in an unconfined compression tester .The specimen has coned ends and its length between the apices of cones is 8cm.find the unconfined compressive strength of clay ,if the specimen fails under an axial load of 46.5 N. The change in the length of specimen at failure is 1cm.
9. Two identical specimens, 4cm in diameter and 8cm high, of partly saturated compacted soil are tested in a triaxial cell under undrained conditions. The first specimen failed at an additional axial load (i.e. Deviator load) of 720 N under a cell pressure of $100kN/M^2$. The second specimen failed at an additional axial load of 915 N under a cell pressure of $200kN/M^2$.The increase in volume of the first specimen at failure is 1.2ml and it shortens by 0.6cm, at failure. The increase in volume of the

second specimen at failure is 1.6ml, and its shortens by 0.8 cm at failure. Determine the value of apparent cohesion and the angle of shearing resistance.

Unit VI

1. Explain the method of locating centre of critical slip circle
2. Explain the stability of upstream slope of earth dam during sudden drawdown condition
3. Explain passive earth pressure theory
4. Write a note on Swedish slip circle method
5. Differentiate between finite and infinite slope
6. Explain active earth pressure theory
7. What are the assumptions of the Rankine theory? Explain the case of submerged backfill
8. Write short notes on:
   a Taylor's stability number and stability chart
   b. Rebhann's method of determination of active earth pressure
   c. Friction circle method
9. Explain active earth pressure at rest
10. Derive the expression for active pressure assuming backfill as dry. Sketch a pressure distribution diagram

Transportation Engineering - II (CED355)

Unit I: Highway Planning and Financing

1. What are the various methods of classifying roads?
2. Compare Nagpur plan and Lucknow plan. Only bring out points in tabular form.
3. Discuss route and planning surveys
4. Discuss various modern model of road financing
5. Discus Bombay road plan
6. Bring out typical characteristics of Roman roads

Unit II: Highway Alignment and Geometric Design

1. Discuss Stopping Sight Distance in detail
2. Discuss the requirements of an ideal alignment for road and highway
3. Discus factors controlling alignment for road and highway
4. Discuss Overtaking Sight Distance in detail
5. Find the stopping sight distance for a design speed of 90 kmph for following two cases
    a. Case a: No slope or gradient
    b. Case a: Gradient of 1 in 40

    (Assume reaction time as 3 sec and co-efficient of friction as 0.35
6. For a design speed of 90 kmph, calculate the safe overtaking sight distance and length of overtaking zone. Assume reaction time as 2 sec and rate of acceleration as 0.53 m/sec^2
7. Calculate the extra widening required for a pavement of width 7.5 m on a horizontal curve of radius 250 m if the longest wheel base of vehicle expected on the road is 7 m.
8. Also calculate the length of transition curve and shift using following data:
9. Design speed = 95 kmph
10. Allowable rate of super-elevation = 1:150
11. Pavement rotated about the centre line of pavement
12. Explain total reaction time of driver and the factors on which it depends. Explain PIVE theory

Unit III: Highway Materials

1. Explain significance of CBR test. What is the procedure of CBR

2. Explain Los Angles Abrasion Test
3. Discuss Deval Abrasion Test
4. Explain Marshall method of mix design
5. Write a detail note on Ductility test on bitumen

Unit IV: Design of Pavement

1. Explain various design factors considered while designing the flexiblepavement.
2. Explain joints in rigid pavement.
3. Explain construction of cement concrete road
4. Explain the CBR method of pavement design' How is this method useful to determine thickness of component layers?

Unit V: Pavement Construction and Maintenance:

1. Explain causes of pavement failure
2. Enlist various types of equipment and machinery used for roadconstruction and explain any one of them.
3. What are the various types of special repair in flexible pavement
4. Explain construction of WBM road
5. Explain various earth moving equipment

Unit VI: Traffic Engineering:

1. Explain spot speed, running speed, space mean speed, time mean speed and average speed of vehicle.
2. Define and discuss OD Survey
3. Discuss Accident Study
4. Explain different road user characteristics and vehicular characteristics which affect the road design

Water Resource Engineering CED (354)

Unit I

1. Draw the neat sketch of hydrological cycle.
2. List out various practical application of hydrology.
3. Explain the measurement of precipitation.
4. Explain different forms of precipitation.
5. Define the network density and derive adequacy of rain gauge station.
6. Explain types of evaporimeters.
7. Give methods to reduce evaporation losses
8. Explain infiltration indices.
9. Describe measurement of evapotranspiration and equation.

Unit II

1. Explain runoff and classification of runoff.
2. Describe hydrograph and hyetograph.
3. Enlist factor affecting on runoff hydrograph and explain.
4. The ordinate of 3hr unit hydrograph are given below.

   Find the ordinates of a 6hr unit hydrograph for the same basin, analytically .What is the Value of discharge in this unit hydrograph?

Times in Hrs	0	3	6	9	12	15	18	21	24	27	30
Ordinates in m^3/sec	0	10	25	20	16	12	9	7	5	3	0

5. Flood hydrograph was recorded in a catchment area 33.48 sq. km had base flow of 10 cumecs. Calculate ordinates of unit hydrograph

Times in Hrs.	0	3	6	9	12	15	18	21
Observed hydrograph(m3/s)	10	14	18	22	26	24	18	10

6. In a typical 6-hr storm, 4 cm excess rainfall is occurring. The flow recorded in the catchment as shown below. Derive an unit hydrograph for 6-hr storm. Assume Base flow is 100 cu.meter/sec.

Times in Hrs.	0	6	12	18	24	30	36	42	48	54	60	66
Observed hydrograph(m3/s)	100	100	300	700	1000	800	600	400	300	200	100	100

Unit III

1. What is the stream gauging? Give site selection for stream gauging.
2. Enlist different type of gauging method and explain any one.
3. Explain advanced techniques equipment's used in gauge discharge measurement.
4. Define flood and causes of flood.
5. Explain flood frequency analysis.
6. Give empirical formulae for estimation of flood peak.

Unit IV

1. Write short note on
    a) Porosity
    b) Permeability
    c) Safe yield of basin
    d) Specific retention
    e) Movement of ground water
2. State Darcy's law. Write its assumption.
3. Develop the equation relating the steady state discharge from well in unconfined aquifer and depth of water at Z know position from well.
4. Derive the formula to calculate discharge of a well in a confined aquifer.

Unit V

1. Give various advantages of irrigation.
2. Describe different types of irrigation methods.
3. Give different techniques of water distribution.
4. Derive relation between duty, delta and base period.

5. Explain factor affecting on duty improving measures.
6. Define various types of irrigation efficiencies.
7. Write a short note on
    a) Duty
    b) Delta
    c) Base period
    d) Crop water requirement
    e) Crop rotation
    f) Effective rainfall
    g) Consumptive use
    h) Kor watering
    i) Paleo irrigation.

Unit VI

1. Define watershed and give the need for watershed management.
2. Explain steps involved in watershed management and small structures.
3. What is water logging? What are the effects of water logging
4. Give different causes of water logging.
5. What are the safety measures would you adopt to prevent water logging.
6. Describe any various method to improve the sub surface drainage.

CED: 352-ENVIRONMENTAL ENGINEERING-I

UNIT 1

1. Distinguish between Primary and secondary air pollutants **(5 marks)**
2. Distinguish between stationary and mobile air pollutants **(5 marks)**
3. What are the physical and chemical properties of atmosphere **(5 marks)**
4. State the various layers of atmosphere with it's importance in short **(5 marks)**
5. Write a short note on: **(5 marks each)**
    a. Photochemical smog
    b. Acid rain
    c. Global warming
    d. Ozone depletion
    e. Green house effect
    f. Gaussian Plume Dispersion model
    g. Atmospheric stability
6. Explain plume behavior with the help of neat sketch. **(8 marks)**
7. What are the major pollutants in automobile exhaust? Mention the suitable control measures. **(8 marks)**
8. How is the plume dispersion related with wind and topography **(8 marks)**
9. Define air pollution, what are the sources of air pollutants and how will classify air pollutants **(8 marks)**
10. What are the inversion conditions? how will they effect the stability and pollution **(8 marks)**
11. Explain the effects of air pollution on human health, animal, vegetation and materials **(8 marks)**

UNIT 2

1. Explain the working of cyclone separator with neat sketch **(5 marks)**
2. Write a short note on Write a short note with neat sketches of following
    a. Spray Towers **(5 marks)**
    b. Electrostatic Precipitator**(5 marks)**
    c. wet scrubbers **(5 marks)**
    d. Cyclone separators **(5 marks)**
    e. Bag house filters **(5 marks)**

UNIT 3

1. What is air prevention & pollution control act – 1981 **(5 marks)**
2. Write a short note on Air quality standards **(5 marks)**
3. How the environmental impact assessment is carried out **(5 marks)**

UNIT 4

1. Define wholesome water and potable water**(2 marks)**
2. What are the methods of population forecasting? **(2 marks)**
3. Enlist various type of water demand.**(2 marks)**
4. What are the factors governing the selection of a particular source of water?**(2 marks)**
5. What are the factors affecting per capita demand?**(2 marks)**
6. What are the factors governing design period?**(2 marks)**
7. Name the various methods of population forecast and explain the circumstances under which it is applicable. **(2 marks)**
8. What is the role of computer applications in water supply systems?**(2 marks)**
9. What are the layouts of water distribution system?**(2 marks)**
10. Write a short note on Intake Towers**(5 marks)**
11. Write a short note on Intake Structures**(5 marks)**
12. Explain the different methods of population forecasting. **(8 marks)**

13. What are the factors to be considered in the selection of source for a water supply scheme? How does the quality of groundwater differ from surface water.**(8 marks)**
14. What factors are required to be considered in the selection of the type of pump? Discuss the situations under which the following types of may be used.
    a. Reciprocating pump b. Air lift pump c. Centrifugal pump
15. Draw a neat sketch of canal intake and explain the working principle. State its merit and demerits. **(8 marks)**
16. Describe the procedure adopted for laying and testing of water mains. **(8 marks)**
17. Explain the treatment processes carried out for the removal of impurities in water? **(8 marks)**
18. Explain the significance of different water quality parameters. **(8 marks)**
19. Explain the impact of climate change in water supply system **(8 marks)**

UNIT 5

1. Define detention period and displacement efficiency**(2 marks)**
2. Define flow through velocity and overflow velocity**(2 marks)**
3. What is schmutzdecke or dirty skin?**(2 marks)**
4. Define aeration and fluoridation**(2 marks)**
5. Differentiate between Temporary and Permanent hardness**(2 marks)**
6. What are the different tests done during water analysis?**(2 marks)**
7. What is the significance of Nitrite and fluoride in water?**(2 marks)**
8. Explain the term " Most Probable Number"**(2 marks)**
9. What is meant by Kjedehl Nitrogen?**(2 marks)**
10. What is threshold number?**(2 marks)**
11. List out four coagulants used in treatment of water.**(2 marks)**
12. What do you mean by "tuberculation" and "incrustration" in pipelines?**(2 marks)**
13. What is the purpose of coagulation?**(2 marks)**
14. Sketch the layout plan of water treatment plant.**(2 marks)**
15. What are various processes required to remove the various types of impurities?**(2 marks)**
16. What is the difference between Unit operations and Unit Process?**(2 marks)**
17. State the purpose and the design principle of Flash mixer.**(2 marks)**
18. How are aeration water carried out?**(2 marks)**
19. Write a short note on Mean Velocity Gradient (5 marks)
20. Describe theory of sedimentation in short **(5 marks)**
21. Explain the different sources of water and their characteristics with respect to turbidity, hardness, chloride and microbiology.**(8 marks)**
22. Explain with a neat sketch, the working of a continuous flow type sedimentation tank **(8 marks)**
23. Discuss the various Physical, Chemical and Biological characteristics of water. **(8 marks)**

UNIT 6

1. What are the methods of desalination?**(2 marks)**
2. What is meant by super chlorination?**(2 marks)**
3. How can you classify filters into different categories?**(2 marks)**
4. What is the necessity for disinfection of water?**(2 marks)**
5. Distinguish between Demineralisation and Disinfection.**(2 marks)**
6. List out the differences between slow sand and Rapid sand filters **(5 marks)**
7. What are the operational troubles involved in Filtration process? **(5 marks)**
8. List the common impurities found in surface and groundwater sources and explain their significance. **(8 marks)**
9. Explain in detail break point chlorination. **(8 marks)**
10. With the help of the diagram, explain the process of Rapid sand filter. **(8 marks)**

11. with a neat sketch, explain the working of a slow sand filter. **(8 marks)**
12. Explain the need and methods for softening and Disinfection of water.
    (8 marks)