AG/15

Con. 5365-09. SP-6455

Dec. 2009 (3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Assume suitable data wherever necessary.

1. (a) Answer any five :– 15
(i) Explain the significance of pH in alum coagulation.
(ii) Why velocity needs to be controlled in grit chamber ?
(iii) Why iron and manganese need to be removed from water ?
(iv) What is population equivalent ?
(v) What is the principle of tube settler ?
(vi) What is sludge volume index ? What is it significance ?
(b) Draw a flow sheet for conventional sewage treatment plant with trickling filter. 5

2. (a) Explain the physical, chemical and biological characteristics of water. Write the standards for potable water. 12
(b) What is B.O.D. ? How do you conduct B.O.D. test in laboratory ? 8

3. (a) Explain the process mechanism of trickling filter. 10
(b) Give a brief description of several disinfectants used in water treatment stating the relative merits and situations where they are most suited. 10

4. (a) Explain the following terms related to activated sludge process – 10
(i) F/M (food to micro-organism ratio)
(ii) S.V.I.
(iii) MLSS
(iv) Hydraulic retention time
(v) Aeration.
(b) Explain the potential filter troubles which may be encountered in the operation of rapid sand filters. Distinguish between rapid sand filter and slow sand filter with reference to – 10
(i) Rate of filtration
(ii) Loss of head
(iii) Size of filter media
(iv) Filter media of sand.

5. (a) Calcualte 1 day 37°C B.O.D. of sewage sample whose 5 day 20°C B.O.D. is 100 mg/lit. Assume K_D at 20°C as 0.1. 5
(b) Design the suitable dimensions of a rectangular sedimentation tank to treat 12 million litres per day of water supply. 6
(c) Explain Bulking and Foaming sludge in an activated sludge treatment plant 5
(d) Compare oxidation pond and oxidation ditch. 4

6. (a) (i) Compare ion-exchange and lime soda softening process. 10
(ii) Discuss briefly the mechanism of coagulation and flocculation.
(b) Calculate the diameter of sewer and velocity of flow for a sewer carrying a flow of 425 lit/sec. when flowing half full. The sewer is laid at a slope of 1 : 200. 10

7. Write a short notes on any four :– 20
(a) Self purification of streams
(b) Operational problems in trickling filters
(c) Short circuiting
(d) Under drainage system of rapid sand filter
(e) Ion exchange process
(f) Tube settlers.

Con. 5695-09. SP-6449

Dec. 2009 (3 Hours) [Total Marks : 100

N.B. : (1) Question No. 1 is compulsory.
(2) Answer any four questions out of remaining six questions.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Assume any suitable data and clearly state the same.
(5) Figures to the right indicate full marks.

1. (a) Discuss the steps involved in shield method of tunnelling in soft rocks. Enlist the plants necessary for the work. 10
(b) Discuss different excavating equipments with their suitability. 10

2. (a) Determine owning and operating cost per hour for an equipment from the following data – 12
(i) Purchase cost = Rs. 15 Lakhs
(ii) Useful Life = 15 years (3000 hr/year)
(iii) Engine capacity = 25 HP
(iv) Salvage value = 10% of purchase cost
(v) Investment cost = 12% of avg. annual investment
(vi) Lubricating cost = 20% of fuel cost
(vii) Operating factor = 0.75
(b) What is meant by lining of tunnel ? Discuss different methods of lining. 8

3. (a) Enlist various types of cofferdams and discuss the factors affecting selection of cofferdam. 10
(b) Discuss how will you achieve dust control, ventilation and drainage during excavating and tunnel. 10

4. (a) What is meant by mass concreting ? What precautions will you take during mass concreting ? 10
(b) Discuss different methods of concreting under water. 10

5. (a) Discuss different types of soil compaction equipments stating operations and suitability. 10
(b) Discuss cost-in-situ pile construction by auger boring. 10

6. (a) Draw neat sketchs of – 10
(i) Sand drains
(ii) Diaphragm wall construction.
(b) Discuss necessity and advantages of the use of plant and machinery in construction projects. 10

7. Write short notes any four of the following – 20
(a) Vaccum concreting
(b) Explosives used in blasting
(c) Cranes
(d) Special form work for concreting
(e) TBM
(f) Grouting and its applications.

Irrigation Engg.

Con. 5415-09.

Dec-2009

SP-6476

(3 Hours) [Total Marks :100

N.B.: (1) Question No. 1 is compulsory.
(2) Attempt any four questions from remaining six questions.
(3) Assuming suitable data where necessary stating them clearly.

1. (a) Define irrigation. Discuss in brief the benefits and ill-effects of irrigation. 10
(b) Describe various methods of computing average rainfall over a basin 10

2. (a) After how many days will you supply water to soil (clay loam) in order to ensure efficient irrigation of the given crop if :— 10
(i) Field capacity of soil = 27%
(ii) Parmanent wilting point = 14%
(iii) Density of soil = 1·5 g/cm^3
(iv) Effective depth of root zone = 75 cm
(v) Daily consumptive use of water for the given crop = 11 mm
(b) What are the factors affecting duty ? How can duty be improved ? 10

3. (a) Given below are observed flows from a storm of 6-h duration on a stream with a catchment area of 500 km^2 :— 10

Time (h)	0	6	12	18	24	30	36	42	48	54	60	66	72
Observed flow (m^3/s)	0	100	250	200	150	100	70	50	35	25	15	5	0

Assuming the base flow to be zero, derive the ordinates of a 6-h unit hydrograph.

(b) The ordinates of a 2-h unit hydrograph are given — 10

Time (h)	0	2	4	6	8	10	12	14	16	18	20	22
2-h UH ordinate (m^3/s)	0	25	100	160	190	170	110	70	30	20	6	0

Determine the ordinates of an S-curve hydrograph and using this determine the ordinates of a 4-h unit hydrograph.

4. (a) Define the following terms :— 10
Aquifer, Aquitard, Aquiclude, Aquifuge, Perched aquifer and specific yield.
(b) The following observations were made on a 300 mm diameter well penetrating an unconfined aquifer. 10
(i) Rate of pumping = 1800 lit/minute
(ii) Drawdown in a test well 30 m away = 1·8 m
(iii) Drawdown in a test well 60 m away = 0·6 m
(iv) Depth of water in the well before pumping = 50 m
Determine the radius of circle of influence and the coefficient of transmissibility of the aquifer.

[TURN OVER

5 (a) Check the stability of the concrete gravity dam section with following details :— 10

Height of dam = 22m.
Top width = 4 m.
Free board = 2m.
Upstream face slope = 1 H : 10 V.
Downstream face slope = 1 H : 3 V.
Take unit weight of concrete = 2400 kg/m^3 and unit shear for concrete = 14 kg/cm^2.

Check the stability for full reservoir condition. Consider only water pressure, self weight and uplift pressure.

(b) Explain different types of spillways. Draw sketches. 10

6 (a) Discuss in brief the causes of failure of earth dams. 10

(b) The slope of channel in alluvium is $S = \frac{1}{5000}$, Lacey's silt factor = 0·9, Channel side slope = $\frac{1}{2}$: 1. Find the channel section and maximum discharge which can be allowed to flow in it. 10

7 Slove any four of the following :— 20

(a) Write short note on aquiduct and syphon aquiduct
(b) Write note on canal lining
(c) Modular and Non-modular outlets
(d) Bandhara irrigation
(e) Head regulator and cross regulator

Con. 5861-09.

SP-6488

Dec. 2009

(3 Hours)

[Total Marks :100

N.B.: (1) Question No. 1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Use of IS 1343-1980 is permitted.
(4) Assume suitable data wherever required but justify the same.

1. (a) What is end zone in post tensioned P. C. member ? Discuss about the stresses distribution in end zone. 6
(b) Explain transmission length in Pre-tensioned P.C. member. 4
(c) Explain Freyssinet system of post tensioning anchorages. 6
(d) Define the terms :— 4
(i) Concordant prestressing
(ii) Transfer stage
(iii) Cracking load
(iv) Pre-tensioning.

2. (a) A rectangular concrete beam of cross section 400 mm deep and 200 mm wide is prestressed by means of 15 wires of 5 mm diameter located 75 mm from the bottom of the beam and 3 wires of diameter of 5 mm, 40 mm, from the top Assuming the prestress in the steel as 1000 N/mm². Calculate the stresses at the extreme fibres of the mid span section when the beam is supporting its own weight over a span of 6 m. If uniformly distributed live load of 6 kN/m is imposed. Determine the maximum working stress in concrete. 10
(b) A box girder of PSC bridge of span 30 m has overall dimensions of 1200 mm by 1800 mm, the uniform thickness of walls is 200 mm, the live load analysis indicates a maximum live load moment of 2000 kNm at the centre of span , the beam is prestressed by Parabolic cables with an effective force of 7000 kN The cables which are concentric at supports have an eccentricity of 800 mm at the centre of span section. Determine the resultant stresses at the centre of span section using the internal resisting couple method. 10

3. (a) The support section of a prestressed concrete beam 120 mm wide and 200 mm deep, is required to support an ultimate shear force of 60 kN. The compressive prestress at the centroidal axis is 5 N/mm², the characteristic cube strength of concrete is 40 N/mm². The cover to the tension reinforcement is 50 mm If fy = 250 N/mm² design suitable shear reinforecement at the section Using IS - 1343-1980. 8
(b) A PSC beam, 200 mm wide and 400 mm deep, is prestressed with wires (area 400 mm²) located at a constant eccentricity of 50 mm and carrying an initial stress of 850 N/mm² the span of the beam is 10 m calculate the percentage loss of stress in wires if the beam is post tensioned. Use the following data :— 12

Es = 210 kN/mm² and Ec = 35 kN/mm²

Relaxation of steel stress	=	5% of the initial stress
Shrinkgge of concrete	=	200×10^{-6}
Creep Co-efficient	=	1·6
Slip at Anchorage	=	1 mm
Frictional Co-efficient for wave effect	=	0·0015 per m.

4. (a) The end block of a post tensioned prestressed concrete beam 300 mm wide and 400 mm deep, is subjected to a concentric anchorage force of 800 kN by a Freyssinet anchorage of area 12000 mm². Design and detail the anchorage reinforcement for the end block. 10

[TURN OVER

(b) A concrete beam having rectangular section 100 mm wide and 250 mm deep is prestressed by a parabolic cable carrying an initial force of 250 kN. The cable has an eccentricity of 50 mm at the centre of span and is concentric at the supports. If the span of the beam is 10 m and the live load is 2 kN/m. Determine the short time deflection at the centre of span. Assuming E = 38 kN/mm² and creep co-efficient ϕ = 2·0, loss of prestress = 20 percent of the initial stress after 6 months. Determine the long time deflection at the centre of span at this stage, assuming that the dead and live loads are simultaneously applied after the release of prestress 10

5. (a) A pre-tensioned PSC beam of rectangular section is required to support a design ultimate moment of 150 kN/m. Design the section if fck is 50 N/mm² and fp = 1600 N/mm². Use IS 1343-1980. 8

(b) The slab having span 10 m is to be designed as a one way restressed conc. slab with parallel post tensioned cables in each of which the force at transfer is 500 kN. If slab is required to support uniformly distributed live load of 20 kN/m² with the comp. and tensile stress in concrete at any stage not exceeding 15 N/mm² and zero N/mm² respectively. 12

Determine the maximum horizontal spacing of the cables and their positions at the mid span section. Assume the loss ratio as 0·8.

6 Design a post tensioned roof girder to suit the following data :— 20

Effective Span = 20 m
Live load = 9 kN/m
Dead load = 1 kN/m (excluding self wt.)
Load factors for D. L = 0·4, for L.L = 10·6
fcu = N/mm², fci = 35 N/mm²
Tensile strength of concrete (ft) = 1·7 N/mm²
Ec = 34 kN/mm², Loss ratio η = 0·8 10 mm diameter high tensile wires having fpu = 1500 N/mm² are available for use.
Es = 200 kN/mm²).
(Give check any for minimum section modulus and eccentricity and prestressing force).

7. (a) A PSC beam having rectangular cross section with a width of 150 mm and depth 400 mm is continuous over two spans. 15

AB = BC = 8 m, the cable with zero eccentricity at the ends and an eccentricity of 50 mm towards the top fibres of the beam over the central support, carries an effective force of 500 kN.

(i) Calculate the secondary moment developed at B.
(ii) If the beam supports conc. loads of 20 kN each at mid points of span. Determine the resultant stresses at the central support section B.
(iii) Locate also the position of the pressure line at section.

(b) What is kern point distance ? Determine the Kern point distances for the unsymmetrical I section with following geometry :— 5

Top flange = 1200 mm × 200 mm thick
Bottom flange = 500 mm × 400 mm thick
Thickness of web = 150 mm
Overall depth = 1400 mm.