No. of Pages : 4

Code : ESM-4
Subject : CIVIL ENGINEERING – 2
Question Paper

Time : 3 Hours | Max. Marks : 200

Q. 1. Define the following terms for Staircase. **5**
- a) Tread
- b) Nosing
- c) Riser
- d) Waist
- e) Going.

Q. 2. Illustrate the following with a neat sketch. **5**
- a) Beveled closer
- b) Mitred closer.

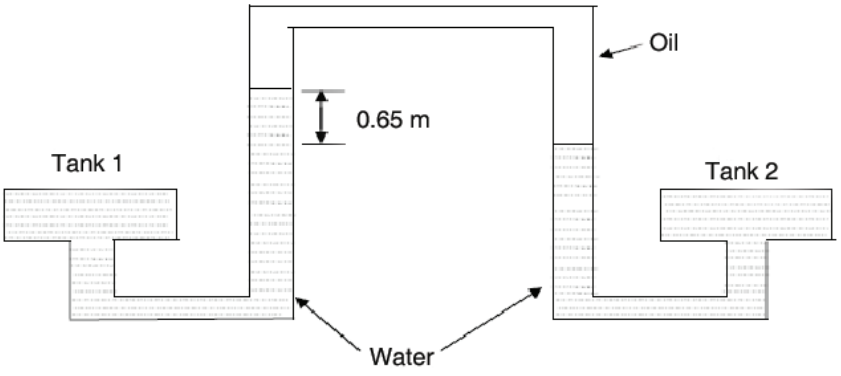
Q. 3. What is the meaning of Flood Control ? Enlist the various measures adopted for controlling flood. **5**

Q. 4. The rainfall of four successive 4-h periods is 1.8, 4.2, 2.8 and 2.0 cm. If the surface runoff resulting from this storm is 30 mm, then find the infiltration index for the storm. **5**

Q. 5. A land is irrigated by 'border strip method' with the help of tube well having discharge of 0.025 cumecs. Find the time required to irrigate a strip of the land having an area of 0.03 ha. The infiltration rate of the soil may be taken as 5 cm/h and the average depth of flow as 8 cm. **5**

Q. 6. What should be the diameter of a water droplet, if the pressure inside is to be 0.0011 kg (f)/cm^2 greater than outside ? Given the value of surface tension of water in contact with air at 20°C as 0.0068 kg (f)/m. **5**

Q. 7. Two tanks, as shown in Fig. 1, are filled with water. The bottoms of tanks are connected to U-tube manometer (inverted) containing oil having specific weight as 7.34 kN/m^3. Find the difference in pressure between these two tanks when the manometer gives reading of 0.65 m. (Take Specific weight of water = 9.81 kN/m^3). **5**



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Q. 8. State the Lacey's regime theory for unlined canal. **5**

Q. 9. What is River Training ? Discuss briefly the various purposes of 'Groynes' provided as river training work. **5**

Q. 10. Briefly describe the various methods of disinfection of water used in a water supply system and write a small note on Break point chlorination. **5**

Q. 11. Explain with a neat sketch the salient features of an Oxygen Sag Curve. **5**

Q. 12. In a continuous flow settling tank of 3 m deep and 60 m long, what flow velocity of water would you recommend for effective removal of 0.025 mm particles at 25°C. The specific gravity of particles is 2.65 and kinematic viscosity for water may be taken as 0.01cm^2/sec. **5**

Q. 13. Briefly describe about the following types of roofs : **10**

a) Gable roof

b) Hip roof

c) Gambrel roof

d) Butterfly roof and

e) Flat roof.

Q. 14. A deep lake with a surface area of 425 ha has following values of parameters during a month (30 days):

Water temperature: 20°C, Relative humidity: 35%, Wind velocity at 1 m above ground level: 14 km/h.

Estimate the volume of evaporated water from the lake during the month. Use Meyer's formula (1915). Take the saturation vapour pressure at the water temperature of 20°C to be 17.54 mm of mercury. **10**

Q. 15. The following is the set of observed data for successive 15 minutes time interval for a 105 minutes of storm in a catchment :

Duration	15	30	45	60	75	90	105
Rainfall (cm/hr)	2.0	2.0	8.0	7.0	1.25	1.25	4.5

If the value of ø-index is 3 cm/hr, estimate the net runoff, the total rainfall and the value of w-index. **10**

Q. 16. Table below gives the necessary data about the crop which is cultivated by a canal diverted from a storage tank. Find the discharge required at head of canal by taking time factor for canal as 11/18. **10**

Crop	Base period (Days)	Area (Ha)	Duty at the canal head (Ha/cumecs)
Bajri (Monsoon)	100	350	1500
Sugar-cane	332	900	625
Wheat	126	575	1350

Q. 17. Explain the functioning of a Tube Settler and bring out its salient advantages. **10**

Q. 18. In a pumping station 18000 m^3 water is to be raised per day from an intake well to a sedimentation tank under the static head of 21 m. Lengths of suction pipes and raising main are 40 m and 150 m respectively. Diameter of the pipes is 50 cm. There are two shifts of working of pumps each of 8 hours. Recommend the number of units of pumps each having BHP of 30. Take coefficient of friction as 0.01 and combined efficiency of motor and pump as 80%. **10**

Q. 19. A centrifugal pump having an impeller of 35 cm outside diameter rotates at 1050 rpm. The vanes are radial at exit and are 7.0 cm wide. The velocity of radial flow through the impeller is 3 m/sec. The velocity in the suction and delivery pipes is 2.5 m/sec and 1.5 m/sec respectively. Neglecting frictional losses, determine the height through which pump lifts and the horse-power of the pump. **10**

Q. 20. Design a hydraulically efficient trapezoidal channel for conveying 100m^3/sec of water. The roughness coefficient is 0.015. The bed slope is 1:5000. Add a free board of 10% of the depth of flow. Sketch the designed cross section. **10**

Q. 21. A waste water plant produces 1000 kg of dry solids per day at a moisture content of 95%. The solids are 70% volatile with a specific gravity of 1.05 and the remaining are non-volatile with a specific gravity of 2.5. Find the sludge volume after digestion which reduces volatile solids content by 50% and decreases the moisture content to 90%. **15**

Q. 22. Flood-frequency calculations for a river, yielded the following results :

Return period T (years)	Peak flood(m^3/s)
100	45,500
150	52,200

Using Gumbel's method of flood-frequency, estimate the flood magnitude in this river with a return period of 450 years. **15**

Q. 23. A Rapid Gravity Sand Filter is proposed to treat 20 million litres of raw water per day. The rate of filtration is 100 litres / min /m^2. Design

i) Size and number of filter beds

ii) Manifold-lateral under drainage system **15**

Q. 24. A city with a population of 2 lakhs has to be supplied with water at the rate of 200 litres per person per day. The probable hourly variation in rate of demand is given in the table below. Determine the capacity of the balancing reservoir to be provided against a constant rate of pumping which is done for 12 hours a day during 5-11 am and 2-8 pm. **15**

Period of the day (in hours)	% of average hourly flow expected
0 – 1	14
1 – 2	10
2 – 3	12
3 – 4	18
4 – 5	25
5 – 6	40
6 – 7	130
7 – 8	120
8 – 9	180
9 – 10	240
10 – 11	220
11 – 12	150
12 – 13	150
13 – 14	70
14 – 15	60
15 – 16	11
16 – 17	150
17 – 18	180
18 – 19	180
19 – 20	160
20 – 21	140
21 – 22	80
22 – 23	45
23 – 24	15