JWL

2011

420066

CIVIL ENGINEERING (Optional)
Paper : II

Standard : Degree in Civil Engineering **Total Marks : 200**

Nature : Conventional (Essay) type **Duration : Three Hours**

N.B. : *1) Answers must be written in **English**.*

*2) Question **No. 1** is **compulsory**. Of the remaining questions, attempt **any Four** selecting one question from **each section**.*

*3) Figures to the **RIGHT** indicate marks of the respective question.*

4) Use of log table, Non-Programmable calculator is permitted, but any other Table/Code/Reference book are not permitted.

5) Make suitable assumptions, wherever be necessary and state the same.

6) Number of optional questions upto the prescribed number in the order in which they have been solved will only be assessed. Excess answers will not be assessed.

7) Credit will be given for orderly, concise and effective writing.

8) Candidates should not write roll number, any name (including their own), signature, address or any indication of their identity anywhere inside the answer book otherwise he/she will be penalised.

SEAL

Marks

1. Answer **any four** of the following (**10** marks **each**) : **40**

(a) (i) Derive the continuity equation for three dimensional, incompressible flow. **5**

(ii) What are the various types of similarities that should exist between a model and its prototype ? Explain each type of similarity in one sentence. **5**

(b) What are the different ways in which the irrigation canals can be aligned, explain with sketch.
A field channel has culturable command area of 2000 hect. The intensity of gram is 30 % and that of wheat is 50%. The kore period of gram and wheat are 18 days and 15 days respectively. Kore depth for gram is 12 cm and for wheat it is 15 cm. Calculate the discharge of field channel. **10**

P.T.O.

Marks

(c) Explain origin and Destination study. What are the various uses of O and D studies ? 10

(d) Define Environmental Impact Assessment. What are the objectives of E.I.A ? Draw a flow diagram of E.I.A. process and explain in brief various steps involved. 10

(e) Explain Camber. What are the objects of camber ? Discuss the factors on which the amount of camber to be provided depends. 10

SECTION – A

2. Answer the following sub-questions :

(a) (i) What is surface tension ? Explain the phenomenon of capillarity associated with surface tension. 6

(ii) What are velocity potential and stream functions ? Give their applications. 4

(b) With neat sketch explain specific energy diagram. A sluice sate discharges water into a horizontal rectangular channel with a velocity of 10 m/ sec and a depth of flow of 1 m. Determine the depth of flow after the hydraulic jump and the consequent loss in total head. 10

(c) Define the term specific speed of centrifugal pump. Also obtain the expression for same. Find the number of pumps required to take water from a deep well under a total head of 89 m. All the pumps are identical and are runnins at 800 r.p.m. The specific speed of each pump is given as 25 while the rated capacity of each pump is 0.16 m^3/sec. 10

d) (i) What is irrotational flow ? Show that the two dimensional flow is continuous and irrotational if the velocity components are, $u = 6xy$ and $v = 3x^2 - 3y^2$. 5

(ii) Show that in laminar study flow, the pressure gradient in the direction of motion is equal to the shear gradient normal to direction of motion. 5

3. Answer the following sub-questions :

(a) (i) Explain the procedure of computing hydrostatic forces on curved surfaces, immersed in liquid. 5

(ii) What are the uses of flownets ? Also list the methods of drawing flow nets. 5

Marks

(b) What is open channel flow ? How it is classified ? A concrete lined trapezoidal channel has to discharge 500 cum/sec. The side slopes are 1 to 1 and the bed slope is 1 in 4000. The permissible velocity is 2.50 m/sec. Determine the bottom width and depth of the section. Take Mannings n = 0.014. **10**

(c) What do you understand by characteristic curves of turbines ? List the parameters required to obtain characteristic curves. A turbine develops 9000 kW when running at 10 r.p.m. The head on the turbine is reduced to 18 m, determine the speed and power developed by the turbine. **10**

(d) (i) Derive the expression for force of impact of a jet when it strikes a moving flat plate at right angles. **5**

(ii) Draw the neat sketch of Siphon. Show TEL and HGL on the sketch. **5**

SECTION – B

4. Answer the following sub-questions :

(a) A storm produced rainfall intensities of 0.75, 2.25 and 1.25 cm/hr. on the drainage basin of area 104 km^2 in 3 successive time periods of 4 hr. each. Assuming a base flow of 10 m^3/sec and ϕ-index of 2.5 mm/hr. Compute total runoff hydrograph

Time in hr.	ordinate of unit hydrograph (cumecs)
0	0
2	12.52
4	21.32
6	23.54
8	17.84
10	14.79
12	12.18
14	10.04
16	8.26

P.T.O.

Marks

18	6.51
20	4.98
22	3.95
24	3.05
26	2.26
28	1.60
30	1.07
32	0.53
34	0

10

(b) Explain the terms specific yield of an aquifer and field capacity.

A 30 cm diameter well penetrates 20 m below the static watertable. After 24 hrs. of pumping at 5000 lit/min, the water level in the test well at 100 m is lowered by 0.5 m and in a well at 30 m away the drawdown is 1.0 m. What is the transmissibility of the aquifer ? **10**

(c) Write short note on reservoir sedimentation, discuss various methods of reservoir sedimentation control. **10**

(d) How does practical profile of a low gravity dam differs from that of the theoretical profile and why ? Discuss step by step the analytical procedure adopted for analysing the stability of a gravity dam (two dimensional analysis). **10**

5. Answer the following sub-questions : **40**

(a) What are the precautions to be taken in selecting a site for the location of a raingauge ?

In a catchment, raingauge station 'X' did not function for a part of month during which a storm occurred. The storm produced rainfall of 84 mm, 70 mm and 96 mm at three surrounding stations A, B and C respectively. The normal annual rainfall at the stations X, A, B and C are 770, 882, 736 and 944 mm respectively.

Marks

Estimate the missing storm rainfall at station 'X' by arithmetic average method and normal ratio method. 10

(b) Define the following terms as used in connection with groundwater.

Capillary fringe, specific yield, field capacity, aquifer, aquiclude. 10

(c) Discuss with a neat sketch the various storage zones of a dam reservoir. What are the factors on which the selection of site of a reservoir depends ? 10

(d) What are the causes of failures of earth dam ? Explain the Swedish slip circle method of analysing the stability of slopes of an earth dam. 10

SECTION – C

6. Answer the following sub-questions :

(a) What is meant by face left and face right of a theodolite ? What instrumental errors are eliminated by face left and fact right observations ? And find out missing figures indicated by X and complete the level book page. Apply usual arithmetic checks : 10

B.S	I.S.	F.S.	H.I.	R.L.	Remarks
4.000			X	X	Point 1
	X			101.000	Point 2
1.000		2.000	X	X	Point 3
	2.000			101.000	B.M.
	2.000			X	Point 4
	X			106.000	Point 5 staff inverted
2.000		X	X	X	Point 6
		1.000		101.000	Point 7

P.T.O.

Marks

(b) What are the essential characteristics of a tacheometer ? And from the following data of a composite curve, **10**

Deflection angle (Δ) = 60° 30 ;

Maximum speed = 90 km per hour ;

Centrifugal ratio = $\frac{1}{4}$;

Maximum rate of change of acceleration = 0.3 m per sec^3 ;

Chainage intersection point = 2570 m

Find :

(a) the radius of the circular curve ;

(b) the length of the transition curve ; and

(c) the chainages of the beginning and end of the transition curves, and of the junctions of the transition curves with the circular arc.

(c) (i) Draw a neat diagram of simple left hand turnout and show its various component parts. **5**

(ii) Design the rate of superelevation for a horizontal highway curve of radius 500 m and speed 100 kmph. **5**

(d) What are the types of traffic control devices ? Explain the road markings. **10**

7. Answer the following sub-questions :

(a) What is the basis of classification of triangulation systems ? Mention the specifications of the primary triangulation. And find the error in 20 m chain from the following data. The length of a chain line when measured with a 20 m chain,was found to be 1341 m. But a 30 m chain, which had one link missing between 25 m and 30 m was used for the purpose, the line was found to be 1345 m long. **10**

(b) What do you understand by GIS and GPS ? Mention the hardware and the software components of GIS. And find out the number of photographs required to cover an area of 232 sq. km from the following data.

The scale of an aerial photograph is

1 cm = 160 m ; the size of the photograph is 20 cm × 20 cm ; the longitudinal lap is 65% ; and the side lap is 35%. **10**

Marks

(c) (i) Explain "sleeper density". State the factors on which sleeper density depends. And calculate the number of sleepers required for construction of a B.G. railway track 768 m long for sleeper density (n+5). 5

(ii) What are the various types of failures in flexible pavements ? Explain any three causes with neat sketches. 5

(d) Explain various measures that may be taken to prevent road accidents. 10

SECTION – D

8. (a) (i) Enlist physical, chemical and biological characteristics of raw water. Write the safe limits for drinking purpose for following parameters

1) pH
2) Hardness
3) Chlorides
4) Sulphate 4

(ii) Draw a neat sketch of rapid sand gravity filter and explain mechanism of filtration. 6

(b) (i) Enlist various types of pumps used for water supply. What factors are required to be considered in selection of pumps ? 5

(ii) Compare advantages and disadvantages of dead end and grid iron systems used for distribution of water. 5

(c) (i) Draw a neat sketch and explain the purpose of drop manhole. 5

(ii) Determine the size of a circular sewer for a discharge of 500 lit/sec. running half full. Assume slope as 0.0001 and Mannings's constant N = 0.015. 5

(d) (i) Draw a neat sketch and explain working principle of trickling filter. 5

(ii) Explain various methods of disposal of municipal solid waste. 5

P.T.O.

Marks

9. (a) (i) Draw a sketch and explain in brief various components of roof top rainwater harvesting system. **6**

(ii) Compare advantages and disadvantages of lime soda process and zeolite process. **4**

(b) (i) What are the requirements of a good distribution system ? **4**

(ii) Explain various methods of water distribution with neat sketches. **6**

(c) (i) Explain environmental significance of B.O.D. and C.O.D. tests. **4**

(ii) What is self cleansing velocity and non scouring velocity in sewer. Write Shield's expression used to work out self cleansing velocity. **6**

(d) (i) Draw a sketch and explain principle of oxidation pond. **4**

(ii) What is Sludge Volume Index (S.V.I.) ? Explain the causes and remedial measures for sludge bulking. What is the appropriate value of S.V.I. in domestic waste water treatment process ? **6**

SEAL