CIVIL ENGINEERING (Paper-II)
(Section-II)

Time Allowed : 2 Hours

(Subjective)

Maximum Marks : 100

Note :

1. Use of standard criteria/missing data for design is allowed but shall be clearly mentioned in Answer book As Assumed.
2. Figures to Right Indicate marks.
3. Part of a question shall be answered in sequence and together.
4. There are internal options of a question and one must attempt all parts of a question (i.e. a, b, c, d of that option only)

1. (a) Explain with sketch hydrological cycle and narrate all process and component parts of the cycle.

(b) Explain in detail uses of water as competitive and complementary and mention about sources of water commonly development for different use with advantages and limitations.

(c) Describe in detail factors affecting Run-off and describe the time of inlet, time concentration and time of flow for a catchment area of a steam.

(d) Explain in detail type of hydrographs and their uses for run off estimates.

Or (entire question)

1. (a) Explain the techniques of water distribution in the farmwith sketches.

(b) Enumerate equations and models used for run-off estimates with their limitations and features in comparision with old qusestion like Rational methods.

(c) Why is water conservation essential in Bihar State? What are suggestion to reduce the damages causedby the flashfloods in the state.

2. (a) A typical 4 hour storm producing 50 mm excess rainfrom a basin is tabulated

Time in hours	0	2	4	6	8	12	16 20
Flow of cumecs	0.00	1.3	3.8	6.2	5.5	3.6	1.5 0.0

Estimate unit hydrograph of run-off for this storm and alsoestimate the peak flow and its occurrence in a flood created by a 68 hour storm which produced 3.0 cm effectiverainfall during 4 hours and 4.0 cm effective rainfall during4 hours and 4.0 cm effective rain fall second 4 hours assuming base flow is negligible.

(b) why is water power tagged as environmentally cleaned source of energy ? Describe principal components of a Hydro-electric power station. Describe how the choice is made for types of turbine for power generation

Or (entire question)

2. (a) Explain terms duty delta and base period of a crop. Calculate delta required for wheat if it requires 7.0 cm of water after 26 days and the base period for wheat is 130 days. Estimate delta of a crop when duty 864 hectares/cumecs on the field, the base period of crop is 130 days.

(b) Find out the annual water volume needed at the distributary which is normally irrigating 10,000 hectares land on which Rabi crop (wheat) is shown in 3500 hectares remaining for Kharif (paddy). If the water requirements of two seasonal crops are 40 cm and 125 cms and their growth period of harvesting

150 days and 120 days respectively. The peak demand discharge may be calculated from assuming the K or water depth for crops 13.5 cm and 19 cm and Kor periods are 4 weeks and 2 weeks respectively.

(c) describe in detail necessity of Irrigation in India. Give advantages and limitations/ill-effects of Irrigation. Describe factors affecting Quality of Irrigation water.

3. (a) Explain the phenomena of sediment transport and problems associated with them and mechanics of sediment transport.

(b) Desribe Scouring and Non-scouring velocities. Water flows at a depth of 0.75 m in a wide stream having a bed slope 1 in 2600. The median diameter of sand bed is 1.2 mm. Determine whether the soil grains are stationary or moving? Determine whether the bed of steam scouring or non-scouring.

(c) Describe in detail how is most economical and hydraulically efficient channel section obtained? Design and irrigation canal to carry 60 cumecs discharge. The canal is to be laid at a slope of 1 in 3900 and critical velocity ration in the soil is 1.1. Use Kutter'srugosity coefficient value of 0.023.

(d) Explain in detail energy and momentum principle and its application to Irrigation conducts/structure with examples

Or (entire question)

3. (a) Explain the classification of Dams with their uses andsuitability for a particular use and factors governingtheir selection.

(b) Describe in detail the procedure of Fixing capacity ofa reservoir. Write all equations dam stability with eachterm explained well.

(c) A concrete gravity dam has following data with sketch(of non-overflowing part) shown in figure below. Calculate any TWO of following.

Top R.L. 179.0 6m

R.L. 180.00m

Slope 2H:3V

R.L. 95.00m
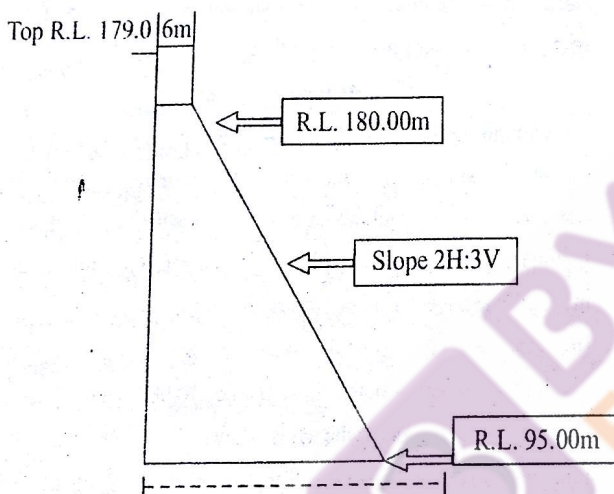
R.L. of Maximum Water Level 175.00 m and Tail water level R.L. =.101.0 m

Calculate

1. Vertical Stresses at heel and toe of the dam

2. Major Principal stress at the toe of the dam

3. The intensity of shear stress on a horizontal plane nearthe toe

Take Weight of Concrete 23.5 kN/m^3 and length of dam. Allowable stress in concrete 2500 kN/m^2

4. (a) Explain the concept of stopping sight distance at levelroad and sloping road. Calculate the stopping sightdistance on a highway at a descending gradient of 2% for a design seed of 80kmph. Assume other data asper IRC Recommendations.

(b) What is cutback? How cutbacks are different fromemulsions?

(c) What are the factors responsible for distress of highway payments Explain method ofBenkelman BeamMethod of pavement evaluation.

(d) Define traffic volume, traffic density and spot speed.Explain concept of Level of Service (LOS) in highway operation

5. (a) Attempt and TWO of Followings :

(i) List Factors affecting domestic waste water generation

(ii) Five joints for Concrete pipe.

(iii) Traps used in house plumbing connection.

(iv) Storm water inlets.

(v) Storm water overflows.

(vi) Drop Manhole.

(vii) lamp hole and Grease traps

(b) **Solve any ONE of Followings**

(i) Design a single stage TF based on NRC equation for average flow rate 1000 cubic meter per day. Effluent from PST BOD$_{5.20}$ = 200 mg/L Effluent from SSTBOD$_{5.20}$ = 60 mg/L. Treatability factor of wasteis 70%

(ii) Why is need for on site sewage treatment? Design either a septic tank or Imhoff tank for 150 users.

(c) compare followings. Try any THREE

(i) ASU and TF

(ii) Aerobic and Anaerobic wastewater treatment systems.

(iii) Oxidation pond and Oxidation ditch.

(iv) PST sludge and SST sludge.

(d) What are systems of sanitation used commonly ? Describe various patterns of sewerage system and conditions underwhich they are best suited.

Or (entire question)

5. (a) What are methods used for population forecasting with their advantages and limitation?

Calculate design population of a city with population of 1,20,000 using geometric increase method if the annual growth rate of population in 1.2%.

(b) What are systems of water supply used? Describe various patterns of water system and conditions under which they are best suited.

(c) What are mechanisms of filtration? Compare slows and Rapid sand Filter critically. Design a Rapids and filter for a flow rate 1254 m^3/day.