

III B.Tech I Semester Regular Examinations, November 2006
WATER RESOURCES ENGINEERING-I
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Define Irrigation. What is the necessity of irrigation.
(b) Describe in brief some of the important irrigation projects and multipurpose river valley projects undertaken or completed after independence of our country. [8+8]
2. (a) Define outlet factor, capacity factor, full supply coefficient and root zone depth.
(b) The CCA for a distributory is 15000 ha. The intensity of irrigation is 40% for rabi and 10% for rice. If kor period is 4 weeks for rabi and 2.5 weeks for rice, determine the outlet discharge. Outlet factor for rabi and rice may be assumed as 1800 ha/m³/sec and 775 ha/m³/sec. What is design discharge of distributory head at 10% conveyance. [8+8]
3. (a) Hydrology is a highly interdisciplinary science. Justify.
(b) Describe the hydrologic cycle with a neat sketch. [8+8]
4. (a) What do you mean by Antecedent precipitation index. Explain.
(b) List out and explain various physiographic factors affecting runoff. [8+8]
5. (a) Distinguish between:
 - i. Vadose zone and phreatic zone
 - ii. Aquiclude and Aquitard
 - iii. Transmissivity and storativity
(b) An unconfined aquifer has an areal extent of 15 km². When 9.5 million cubic metres of water was pumped out, the water table was observed to go down by 2.4 m. What is the specific yield of the aquifer? If the water table of the same aquifer rises by 12.5 m during a monsoon season, what is the volume of recharge? [9+7]
6. (a) What is the necessity of drainage below the lining. Discuss the various drainage and pressure release arrangements.
(b) Using Lacey's basic regime equations, derive an expression for Lacey's scour depth. [8+8]
7. (a) Draw a typical cross section of a barrage founded on pervious foundations and explain its salient features.

- (b) What is meant by scour. What precautions do you take against it during the design of weirs. [8+8]
8. (a) What do you understand by critical gradient. What will happen if the critical gradient is exceeded. What is Khoslas safe exit gradient.
- (b) Explain how Khoslas theory is modification over Bligh's theory. [8+8]

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1. (a) Write an essay on History of irrigation developments in India.
(b) Discuss in detail the ill effects of irrigation. [8+8]
2. (a) Explain as how the following factors affect the duty of a crop.
 - i. Soil and sub-soil condition
 - ii. Stage of growth
 - iii. Temperature
 - iv. Rainfall.(b) Compute the depth and frequency of irrigation required for a certain crop if root zone depth is 100 cm, field capacity is 22%, wilting point is 12%, density of soil is 1.5 gm/c.c, consumptive use is 25 mm/day and efficiency of irrigation is 50%. Assume 50% depletion of available moisture before application of irrigation water at field capacity. [8+8]
3. (a) Discuss various methods of reducing evaporation from a water body.
(b) The Hortons infiltration equation for a basin is given by $f=10+30 e^{-0.8t}$ where f is in mm/hr and t is in hours. What are the values of f_0 , f_c and k . If a storm occurs on this basin with an intensity of more than 40 mm/hr, determine the depth of infiltration for the first one hour and the average infiltration rate for the first two hours. [8+8]
4. (a) Explain how runoff is estimated using Khosla's method.
(b) Explain with a neat sketch how the storage requirement to meet a uniform demand rate can be determined using a mass curve. [8+8]
5. (a) Define cone of depression and radius of influence. Explain steady state radial flow in an aquifer.
(b) Calculate the coefficient of permeability from the following data of a 15 cm diameter strainer tube well discharging 50 lps. The length of the strainer is 40 m and the drawdown is 5 m. The radius of influence may be assumed as 300 m. Determine the discharge when
 - i. the depression head is increased to 6m.
 - ii. the well diameter is increased to 30 cm.
 - iii. the strainer length is increased to 60 m.[8+8]
6. (a) What are Lacey's basic regime equations. Starting from these equations derive the equations for wetted perimeter, Hydraulic Radius and Bed slope.

- (b) Explain the construction of brick tile lining. Draw and explain single tile and double tile lining. [8+8]
7. (a) What are the different types of weirs. Discuss their salient features.
- (b) What are the functions of under sluices in a diversion head works. Discuss the general requirements of the under sluices. [8+8]
8. (a) Explain Khosla's theory and concept of flow nets with the help of neat sketches.
- (b) Explain the surface flow considerations involved in the design of thickness of sloping glacis and the down stream floor of a weir for different flow considerations. [8+8]

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1. (a) What is meant by furrow irrigation and sprinkler irrigation. Which one is preferred in India and why.
(b) Write short notes on:
 - i. Sodium Absorption Ratio.
 - ii. Irrigation water quality improvement. [8+8]
2. (a) Define base period, crop period, Intensity of irrigation and cash crops.
(b) Water is released at the rate of 5 cumecs at the head sluice. If the duty at the field is 100 hectares/cumec and the loss of water in transit is 30%, find the area of the land that can be irrigated. [8+8]
3. (a) Describe different methods of determining the average depth of rainfall over an area. Bring out merits and demerits of each method.
(b) A 3 hour storm occurred at a place and the precipitations in the neighboring raingauge stations P, Q and R were measured as 3.8, 4.1 and 4.5 cm respectively. The precipitation in the neighboring station S could not be measured since the raingauge is inoperative. The normal precipitations in the four stations P, Q, R and S as per IMD were 45, 48, 53 and 50 cm respectively. Estimate the storm precipitation at station S. [8+8]
4. (a) Explain Depression storage and Detention storage.
(b) List out and explain various climatic factors affecting runoff. [8+8]
5. (a) What are the advantages of ground water compared to surface water. Also explain the occurrence of ground water.
(b) In a recuperation test on an open well, the water level was depressed by 4 m and it was observed to rise by 2.5 m in 90 minutes. What is the specific capacity of the well. What would be the yield from the well under a depression head of 3m, if the diameter of the well is 7.5 m. [8+8]
6. (a) What is the necessity of drainage below the lining. Discuss the various drainage and pressure release arrangements.
(b) Using Lacey's basic regime equations, derive an expression for Lacey's scour depth. [8+8]
7. (a) What is the difference between a diversion head works and storage head works. What considerations will you have while selecting site for a diversion head works.

- (b) What are the functions of a silt excluder. Discuss the various design considerations. [8+8]
8. (a) Explain the design procedure of a vertical drop weir by Khoslas theory.
- (b) Explain the correction for mutual interference of piles and how it is applied with the help of Khoslas curves. [8+8]

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1. (a) Distinguish between
 - i. Perennial Irrigation and Inundation Irrigation.
 - ii. Direct irrigation and river canal irrigation
 - iii. Storage irrigation and diversion irrigation.
- (b) What do you understand by major projects, medium projects and minor projects. [9+7]
2. (a) Discuss optimum utilization of irrigation water. Also discuss irrigation efficiencies.
- (b) An area of 1 ha was irrigated in 10 hours with a stream of 30 lit/sec. Depth of root zone was 1 m and available moisture holding capacity 16 cm/m. Irrigation was given when 50% of available moisture was depleted water application efficiency was 60%. Determine the water storage efficiency. [8+8]
3. (a) Describe the principle and working of a weighing bucket type recording rain gauge with a neat sketch. Mention its advantages and disadvantages.
- (b) The isohyets drawn for a storm which occurred over a drainage basin of area 950 km² yielded the following information.

Isohyet Interval (mm)	85-75	75-65	65-55	55-45	45-35
Area between isohyets (km ²)	125	236	264	175	150

[8+8]

4. (a) How is runoff estimated using stranger's tables and Barlow's tables.
- (b) What is a flow duration curve. How is it constructed. [8+8]
5. (a) Define cone of depression and radius of influence. Explain steady state radial flow in an aquifer.
- (b) Calculate the coefficient of permeability from the following data of a 15 cm diameter strainer tube well discharging 50 lps. The length of the strainer is 40 m and the drawdown is 5 m. The radius of influence may be assumed as 300 m. Determine the discharge when
 - i. the depression head is increased to 6m.
 - ii. the well diameter is increased to 30 cm.
 - iii. the strainer length is increased to 60 m. [8+8]

6. (a) What do you mean by balanced depth off cutting. Obtain an expression for balanced depth of cutting for a channel of a given cross section.
(b) What are the qualities of a good lining material. How far these qualities are satisfied by cement concrete lining. [8+8]
7. (a) What are the two principal methods of regulating the canal supplies in a diversion head works scheme. What are their comparative merits and demerits.
(b) Discuss the use of guide banks and marginal bunds in a river regulator scheme. [8+8]
8. Design a vertical drop weir using Bligh's theory for the following data.
(a) Maximum flood discharge = 1200 cumecs.
(b) HFL before construction of weir = 172.5 m
(c) River Bed Level = 168.0 m
(d) FSL of canal = 171.5 m
(e) Allowable Afflux = 1 m
(f) Coefficient of creep = 11
The weir wall need not be designed and its dimensions may be taken as top width = 3 m; Bottom width = 6 m. Assume any other data not given. [16]
