

III B.Tech. I Semester Regular Examinations, November -2005
WATER RESOURCES ENGINEERING-I
(Civil Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Distinguish between:
 - i. Wild flooding and controlled flooding.
 - ii. Free flooding and basing flooding
 - iii. Sprinkler irrigation and drip irrigation.(b) Explain different methods of controlled flooding with the help of neat sketches.

[8+8]
2. (a) Name the principal Indian crops and detail their water requirements. Also suggest ways to increase the duty in an irrigation system.
(b) During a particular stage of the growth of a crop, consumptive use of water is 2.8 mm/day. Determine the interval in days between irrigations and depth of water to be applied when the amount of water available in the soil is 25%, 50%, 75% and 0% of the maximum depth of available water in the root zone which is 80 mm. Assume irrigation efficiency to be 65%.

[8+8]
3. (a) Hydrology is a highly interdisciplinary science. Justify.
(b) Describe the hydrologic cycle with a neat sketch.

[8+8]
4. What are the various components of runoff? Describe how each component is derived in the runoff process.

[16]
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) Explain the general consideration for alignment.
(b) Design a regime channel to carry a discharge of 50 cumecs. Assume silt factor as 1.0.

[8+8]
7. (a) How does a diversion weir align. Explain the different components of a diversion weir scheme.

- (b) What do you mean by a weir. What are different construction materials which may be used for weirs and how are the weirs classified on this score. [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]

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1. (a) Irrigation is principal user of water. Explain. Also explain national water policy of India.
(b) How will you describe planning for irrigation projects, its objectives and various parameters. [8+8]
2. (a) Explain water use efficiency, water distribution efficiency and consumptive use efficiency.
(b) An area of 300 ha is to be irrigated from a minor channel with one outlet. CCA is 80% of total area. The intensity of irrigation is 50% for rabi crop and 30% for kharif crop. Taking loss in conveyance system as 5% of outlet discharge, determine the head discharge of the channel. Take outlet discharge factor for wheat season as 1500 ha/m³/sec and for rice season as 1000 ha/m³/sec.[8+8]
3. (a) Define raingange density. Discuss the ISI norms for the raingange density.
(b) The average annual rainfall in Cm at 4 existing raingauge stations in a basin are 105, 79, 70 and 66. If the average depth of rainfall over the basin is to be estimated within 10 % error, determine the additional number of gauges needed. [8+8]
4. (a) Define unit Hydrograph. What are the uses of unit hydrograph. Explain what do you understand by the principle of linearity and principle of time invariance in UH theory.
(b) Explain the factors affecting flood hydrograph. [8+8]
5. (a) Describe the Theis method of determining the aquifer parameters using the pumping test data.
(b) A well with a radius of 0.5 m penetrates completely a confined aquifer of thickness 40 m and permeability 30 m/day. The well is pumped so that the water level in the well remains at 7.5 m below the original piezometric surface. Assuming that the radius of influence is 500 m, compute the steady state discharge from the well. [8+8]
6. (a) What are the various investigations required for a canal project (Distribution system).Explain in brief.
(b) Explain the limitations of Kennedies theory. [8+8]
7. (a) How does a diversion weir aligned. Explain the different components of a diversion weir scheme.

- (b) What do you mean by a weir. What are different construction materials which may be used for weirs and how are the weirs classified on this score. [8+8]
8. A weir with a vertical drop has the following particulars.
- | | |
|--|--------------|
| Nature of bed: course sand with the value of | |
| Bligh's C | = 12 |
| Flood Discharge | = 300 cumecs |
| Length of weir | = 40 m |
| Height of weir above low water | = 2 m |
| Height of falling shutter | = 0.6 m |
| Top width of weir | = 2.0 m |
| Bottom width of weir | = 3.5 m |
| Design the length and thickness of aprons and cross section of the weir. | [16] |

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1. (a) Give a bird's eye view of irrigation engineering, tracing the history of a drop of water from the cloud to field.
 (b) List out the ill effects of irrigation. How would you reduce the ill effects.[8+8]
2. (a) Distinguish between
 - i. GCA and CCA
 - ii. culturable cultivated area and culturable uncultivated area.
 (b) A water course has a CCA of 1500 hectares. The intensity of irrigation for crop A is 45% and for B is 40%, both the crops being rabi crops. Crop A has a kor period of 20 days and crop B has kor period of 15 days. Calculate the discharge of water course if the kor depth for crop A is 10 cm and for B it is 16 cm. [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 is a master depletion curve. How it is constructed and used to separate base flow from total runoff.
 (b) The following are the ordinates of the hydrograph of flow from a catchment area of 770 km² due to 6 hr rainfall. Derive the ordinates of 6 hr unit hydrograph. Assume a constant baseflow of 40 m³/sec.

Time (hr)	0	6	12	18	24	30	36	42	48	54	60	66	72
Discharge (m ³ /sec)	40	65	215	360	400	350	270	205	145	100	70	50	42

[8+8]

5. (a) What do you understand by safe yield of a ground water basin. What are the factors influencing the safe yield. What is meant by overdraft and mining.
 (b) A well is pumped at the constant rate of 0.004 m³/sec in a confined aquifer of transmissivity is 0.004 m²/sec and storativity is 0.0005. Calculate the draw-down 24 hr after the start of pumping in an observation well located at a distance of 250 m from the pumped well. [8+8]
6. (a) Explain the general consideration for alignment.
 (b) Design a regime channel to carry a discharge of 50 cumecs. Assume silt factor as 1.0. [8+8]

7. (a) What do you mean by diversion head works. Describe various investigations required for diversion head works.
- (b) What are the functions of canal head regulator. Discuss the general design considerations of a head regulator. [8+8]
8. Calculate uplift pressure at key points of the pile of the structure shown in figure 1. Also check the thickness provided and exit gradient. Safe $G_E = 1/5$ use Khoslas curves.

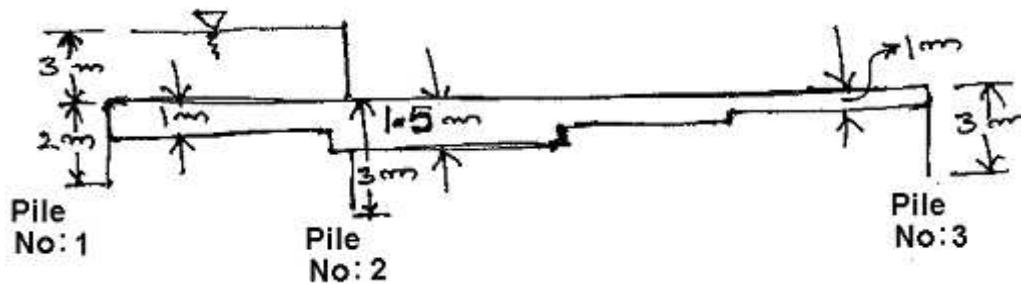


Figure 1:

[16]

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1. (a) Compare and contrast surface and sub-surface irrigation.
(b) Explain the furrow method of irrigation. With the help of a neat sketch. What are its advantages. [8+8]
2. (a) Define soil moisture Deficiency, crop ratio, paleo irrigation and overlap allowance.
(b) 10 cumecs of water is delivered to a 32 hectare field, for 4 hours. Soil proving after the irrigation indicates that 0.3 m of water has been stored in root zone. Compute the water application efficiency. [8+8]
3. (a) What is a rainfall hyetograph. How is it derived from a given rainfall mass curve.
(b) In a certain river basin there are six raingauge stations. The normal annual rainfall depths at the stations being 42.4, 53.6, 67.8, 78.5, 82.7 and 95.5 cm respectively. Determine the optimum number of raingauge stations to be established in the basin, if it is desired to limit the error in the mean value of rain-fall over the catchment to 10% and indicate how you distribute them. [8+8]
4. Describe in detail how the total precipitation is transformed into the total runoff. [16]
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) Discuss the classification of canals based on discharge and its relative importance in a given network of canals.
(b) Design an irrigation channel to carry a discharge of 50 cumecs by Kennedy's theory. Assume a slope of 1 in 5000, $N = 0.025$ and $m = 1.0$. [8+8]

7. (a) Explain the different stages of a river. Which stage is suitable for head works. Also explain the criterion for fixing pond level and water way.
- (b) State the functions of the following in a head works with illustrate sketches.
- i. Silt excluder
 - ii. Divide wall
 - iii. Sheet piles.
- [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
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