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## GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2022

### BPCAG7030 – Drainage Engineering

(AGE)

Time: 3 hrs

Maximum: 70 Marks

**Answer ALL Questions**

**The figures in the right hand margin indicate marks.**

**PART – A: (Multiple Choice Questions)**

**(1 x 10 = 10 Marks)**

**Q.1. Answer ALL questions**

- |   | [CO#] | [PO#] |
|---|-------|-------|
| a. The lateral seepage of water in a relatively pervious soil above a less pervious layer is:   | CO1   | PO1   |
| (i) Percolation   |       |       |
| (ii) Infiltration   |       |       |
| (iii) Interflow   |       |       |
| (iv) Seepage  |       |       |
| b. The movement of water in seepage is:   | CO1   | PO1   |
| (i) Downward  |       |       |
| (ii) Lateral  |       |       |
| (iii) Both (a) and (b)  |       |       |
| (iv) None of these  |       |       |
| c. The application of Darcy's Law is limited by the condition that flow through the porous medium must be:  | CO2   | PO1   |
| (i) Laminar   |       |       |
| (ii) Turbulent  |       |       |
| (iii) Intermediate  |       |       |
| (iv) None of these  |       |       |
| d. The quantity of water going through various individual path of hydrological cycle can be described by:   | CO1   | PO1   |
| (i) Continuity equation   |       |       |
| (ii) Water budget equation  |       |       |
| (iii) Hydrologic equation   |       |       |
| (iv) All are correct  |       |       |
| e. Of the following, which is the form of precipitation?  | CO1   | PO1   |
| (i) Rainfall  |       |       |
| (ii) Snowfall   |       |       |
| (iii) Hail  |       |       |
| (v) All are correct   |       |       |
| f. The magnitude of precipitation varies with:  | CO1   | PO1   |
| (i) Time  |       |       |
| (ii) Space  |       |       |
| (iii) Both (a) and (b)  |       |       |
| (v) None of these   |       |       |
| g. The side slope of bund is function of:   | CO2   | PO1   |
| (i) Bund's height   |       |       |
| (ii) Angle of repose off fill material  |       |       |
| (iii) Both (a) and (b)  |       |       |
| (v) None of these   |       |       |
| h. A land is said to be water-logged when _____   | CO1   | PO1   |
| (i) the aeration is stopped in the root zone due to the rise in water content   |       |       |
| (ii) there is a reduction in crop yield   |       |       |
| (iii) there is an accumulation of alkali salts in the root zone of the crop   |       |       |
| (iv) there is salinity in the soil  |       |       |
| i. Which of the following type of irrigation methods uses artificial rain to irrigate the land?   | CO1   | PO1   |
| (i) Border Irrigation Method  |       |       |
| (ii) Furrow Method  |       |       |
| (iii) Sprinkler Irrigation Method   |       |       |
| (iv) Drip Irrigation Method   |       |       |
| j. A method of drainage that is used in high water table areas, hilly areas, having open drain collection to common field outlet under the surface is _____ | CO2   | PO1   |
| (i) Open channel  |       |       |
| (ii) Tile drainage  |       |       |
| (iii) Gravity outlet  |       |       |
| (iv) Parallel drains  |       |       |

**PART – B: (Short Answer Questions)****(2 x 10 = 20 Marks)**Q.2. Answer ALL questions

	[CO#]	[PO#]
a. What are the sources of excess water in the agricultural field?	CO1	PO1
b. What are the different causes of water logging?	CO1	PO1
c. What are the adverse effect of water logging in agricultural field?	CO1	PO1
d. What are the sources of excess water in the agricultural field?	CO1	PO1
e. Write the short notes on Consumptive use of Water	CO4	PO1
f. Enlist the requirements to construct a good drain outlet.	CO2	PO1
g. Write the full form of GIR, NIR, MoWR, and ICID?	CO3	PO1
h. What is the Purpose of Subsurface Drainage?	CO3	PO1
i. Define the term Leaching and Soil Salinization.	CO4	PO1
j. Classify the salt affected soil. Also define Acid soil.	CO4	PO1

**PART – C: (Long Answer Questions)****(10 x 4 = 40 Marks)**Answer ALL questions

	Marks	[CO#]	[PO#]
3. a. What are the different types of surface drainage system? Explain any two types of surface drainage system.	5	CO2	PO1
b. Explain the different ways to prevent the water logging problem.	5	CO1	PO1
(OR)			
c. Write about the components in designing the surface drainage system.	5	CO2	PO1
d. Define Land Grading and Land Smoothing. Also Enlist various types of surface drainage system.	5	CO2	PO1
4. a. Explain the factors affecting water logging in details	5	CO1	PO1
b. What are the different component of pipe drainage system? Write the functions of each component in details.	5	CO3	PO1
(OR)			
c. An agricultural soil contains 47% pore space, and the moisture content after gravity drainage is 39% (by volume). Find the void ratio, drainable porosity, and drainable water volume from a 20m × 15m plot having 1.0m root zone depth.	5	CO2	PO3
d. For a falling-head permeability test, the following values are given:			
• Length of specimen = 200 mm			
• Area of soil specimen = 1000 mm <sup>2</sup>			
• Area of standpipe = 40 mm <sup>2</sup>			
• At time $t = 0$ , the head difference is 500 mm			
• At time $t = 180$ sec, the head difference is 300 mm			
Determine the hydraulic conductivity of the soil in cm/sec.	5	CO2	PO2
5. a. A watershed of 1500 hectares is discharging through a drain at an average ratio of 2.5 m <sup>3</sup> /s. Calculate the drainage coefficient. If the drainage coefficient is 3 cm, what would be the discharge through the drain?	5	CO2	PO2
b. (i) In a subsurface drainage network, 10 lateral drains laid at a spacing of 40 m and each 150m long, join a collector drain. The average discharge at the outlet of the collector drain was 10L/s when the water table dropped from ground surface to 40 cm below the ground surface in 3days. Find	3	CO3	PO2

- (i) the average drainable porosity of the soil.
- (ii) Define Field Capacity, and Wilting Point. 2
- (OR)
- c. What are different methods to determine the hydraulic conductivity of soil in the laboratory? Explain any one method in details. 5 CO2 PO2
- d. The results of a constant-head permeability test for a fine sand sample having a diameter of 150 mm and a length of 300 mm are as follows:
- Constant head difference = 500 mm
  - Time of collection of water = 5 min
  - Volume of water collected = 350 cm<sup>3</sup>
  - Temperature of water = 24°C
- CO2 PO2
- Determine the hydraulic conductivity for the soil at 20°C.
6. a. Write the short notes on non-conventional drainage system. 5 CO3 PO1
- b. Tile drains have to be installed in the agricultural land having soil permeability  $2.3 \times 10^3$  mm/sec. An impervious strata exist at 3.2 m below land surface and it is desirable to keep water level 1m below land surface. Average discharge is 2mm/day. If tile drains are planned to be placed 1.5 m below land surface. Determine the Drain spacing assuming equivalent depth to be same as tile depth. 5 CO3 PO3
- (OR)
- c. Derive the below Hooghoudt Equation  $q = \frac{8KDh+4Kh^2}{L^2}$  for determining the drain spacing. Also write the assumptions considered in Hooghoudt's Equations. 6+2 CO3 PO3
- d. The depth from soil surface to subsurface tile drains, impermeable soil layer and the highest water tables are measured as 3.2 m, 5.0m and 0.8m respectively. What is the effective hydraulic head for drainage in meter? 2 CO3 PO3

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