



UNIVERSITY OF THE PUNJAB

Part-I : Supplementary Examination 2018

Examination:- M.A./M.Sc.

Roll No.

Subject: Mountain Conservation and Watershed Management
PAPER: III (Integrated Watershed Management)

MAX. TIME: 3 Hrs.
MAX. MARKS: 100

NOTE: Attempt only FOUR questions. Attempt at least TWO from each section of subjective. Write to the point with the clear concept.

Section-1: Hydrology of Upland

- Q.1 a) Differentiate between the following: (6)
i. Hydrograph and Hyetograph
ii. Surface Water Hydrology and Ground Water Hydrology
iii. Infiltration and Percolation

b) Describes the Hydrological cycle and write the water mass balance equation? (12)

c) Compute the discharge of a channel using the velocity-area method from the data given in following Table. (7)

Distance from bank (m)	0	2	5	8	11	14	17	21
Depth (m)	0	0.5	2	2.5	2.4	1.5	1	0.5
Mean Velocity (m/s)	1	2.5	3	3	3	3	3.5	2
Width of subsection (m)	0	2	4.5	6	6	4	2	1

- Q.2 a) Give short answers with clear concept: (6)
i. What are the objectives of Snowmelt study?
ii. What are sources of Ground water contaminants?
iii. What is meant by water losses and enlist its forms?

b) Categorize different instruments used for measurement of precipitation with respect to their merits and limitations? (12)

c) Assume that Mangla Reservoir has surface area of 39 sq. km in the beginning of a certain month and the water depth is 76.20 m for this whole surface of the lake. Further assume that sides of reservoir are nearly vertical. Now in that month the reservoir received an average inflow of 226.50 cumec as a direct runoff, and direct precipitation of 125 mm. The outflow from the reservoir was 170 cumec and evaporation and seepage losses were estimated to be 113 mm during that month. Find out depth of reservoir at the end of that month and total increase or decrease in the storage. (7)

- Q.3 a) Give short answers: (6)
i. Explain degree day w.r.t snowmelt process with any example?
ii. What is the application of ground water hydrology?
iii. Enlist the types and forms of precipitation?

b) Discuss the various factors, which affect the runoff from a snowmelt? (12)

c) Precipitation station "X" was inoperative for part of a month during which a storm occurred. The storm totals at three surrounding stations A, B and C were respectively 10.7, 8.9 and 12.2 cm. The normal annual precipitation amounts at stations X, A, B and C are respectively 97.8, 112, 93.5 and 119.9 cm. Estimate the storm precipitation for station 'X'. (7)

- Q.4 a) Define the following terms: (6)
Lowland Hydrology; Ablation; Glacier; Hydrograph; Flood Routing; Evapotranspiration

b) Define hydrograph. Draw a single-peaked hydrograph and indicate its various components. Also briefly explain with the help of a neat sketch any three methods for separation of baseflow from total hydrograph of runoff. (12)

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- c) The average snowline is at 1500 m elevation and temperature index located at 1800 m elevation indicated a mean daily temperature of 7°C on certain day. Assuming a temperature decrease of 1°C per 200 m increase in elevation and degree day factor of 5mm/degree-day. Compute the snowmelt runoff for that day. An area 780Km² is between freezing point and snowline from the elevation curve for the basin. (7)

Section II: Integrated Watershed Management

- Q.5 a) Define the following terms: (5)
 Integrated Watershed Management; Sustainable Watershed Management; Watershed Planning; Watershed Rehabilitation; Watershed Degradation
 b) Describes the principles and objectives of watershed management and development. (12)
 c) A catchment has a perimeter of 1020 Km, length of 300 Km and an area of 38520 km². Calculate the (i) compactness coefficient, (ii) form factor, (iii) elongation ratio, and (iv) circularity ratio. (8)

- Q.6 a) Differentiate between the following: (6)
 i. Structural measures and Vegetative measures
 ii. Watershed and Basin
 iii. Micro catchment and Macro catchment rainwater harvesting
 b) Describes the role/responsibility of different departments/organizations for management of mountainous watershed in Pakistan. (11)
 c) Design a rainwater harvesting system for meeting water requirement of 50m² garden and five-member family living in a building with a rooftop area of 100 m². The average annual rainfall in the region is 600 mm. Daily drinking water requirement per person (drinking and cooking) is 10 liters. The irrigation system for the garden provides the equivalent of 6 litres/m² per use, and has an irrigated area of 50 m². The water is irrigated three times per week. (8)

- Q.7 a) Give short answer with clear concept. (6)
 i. Write down the purpose of water harvesting?
 ii. Write the problems associated with watersheds?
 iii. State the watershed field survey and planning teams
 b) What is the need of management of natural drainages of watershed? Discuss the different measures/structures used for its stabilization. (11)
 c) Compute the mean bifurcation ratio, Drainage Texture, Drainage Intensity and Infiltration Number from following data of Kabul River Basin which was derived from the 90×90 m DEM through GIS: Area of basin = 10538 Km² and perimeter of basin = 1000 Km (8)

Stream Order	1	2	3	4
Stream Number	24	12	7	7
Stream Length (km)	1400	449	489	205

- Q.8 a) Give short answer with clear concept: (6)
 i. Enlist the components of rainwater harvesting system for domestic purposes.
 ii. Write down the stages of a project cycle?
 iii. Why we need watershed survey and planning?
 b) Discuss different monitoring and evaluation tools used in watershed management. (9)
 c) Describe the framework of Watershed Management for Source Water Protection of water supply. (10)