June 2022

Water Resource Management (Elective)

Time Allowed: 3 Hours *Full Marks: 70*

GROUP-A

1. MCQ: Choose the correct alternatives: (Answer *any ten* questions) (10X1=10)

a) The runoff is affected i) type of precipitation, ii) rain intensity and duration of rainfall, iii) direction of prevailing storm, iv) all of these

b) The shape of recession limb of a hydrograph depends upon i) basin characteristics only, ii) storm characteristics only, iii) both (i) and (ii), iv) none of these

c) River training for depth is achieved by i) Groynes, ii) Construction of dykes or leaves, iii) Both (i) and (ii), iv) Groynes and bandalling

d) The best , alignment for a canal is when it is aligned along- i) Vally Line, ii) Stream Line, iii) Contour Line, iv) Ridge Line

e) Hydrograph is the graphical representation of i) runoff and time, ii) surface runoff and time, iii) ground water flow and time, iv) rainfall and time.

f) The minimum recommended free board for lined canals carrying discharge of more than 10 cumec is—i) 0.3 m, ii) 0.6 m, iii) 0.75 m, iv) 1.2 m.

g) The inclination of attracting groynes with river bank is— i) 450 to 600, ii) 600 to 900, iii) 900 to 1200, iv) None the above.

h) In India, rain fall is generally recorded at i) 8.00 AM, ii) 10.00AM, iii) 1.00 PM. iv) 4.00 PM

i) A flash flood is a flood that: i) is caused by heavy rain rather than from the flooding of a river, ii) occurs in urban areas iii) occurs suddenly and unexpectedly and for a short duration iv) is caused by the blocking of drains.

j) The size of a flood is measured by: i) the rate of flow of water in a waterway or river, ii) the level of water in a waterway or river, iii) a river gauging station, iv) all of the above.

k) The collection of rainwater for use, is called i) Rain collection ii) Rainwater harvesting iii) Rain digging iv) Rainwater pumping

l) An aquifer can hold water _____ and the state of water is _____. i) Permanently – State of flow ii) Temporarily – State of flow, iii) Permanent – State of stagnancy, iv) Temporary – State of stagnancy

m) The optimum utilization of irrigation water means getting i) maximum yield with the maximum amount of water available, ii) maximum yield with the minimum amount of water available, iii) minimum yield with the maximum amount of water available iv) maximum yield with the optimum amount of water available

n) This water which cannot be removed by capillarity is not available to the plants, and is called the i) Soil Water, ii) Hydrographic Water, iii) Hygroscopic Water, iv) Capillary Water

o) The unit of filed capacity is i) Unit less, ii) Cubic meter, iii) Cumec, iv) Cube meter / kN.

2. Fill in the blanks - Write correct word to fill in the blanks (Answer *any ten* questions) (10X1=10)

a) The graphical representation of discharge of a river against time is known as _____.
b) Spurs are generally aligned _____ to the flow direction of the river.
c) The ground water contribution to the stream is known as _____.
d) Short-Range flood forecasts gives an advance warning of _____hr for floods.
e) The permeable formation of the soil of the earth's crust is known as _____.
f) The impermeable formation which contain water but is not capable of transmitting water is known as _____.
g) The zigzag fashion of flow of river is termed as_____.
h) Check dams are used _____.
i) Recuperation test is adopted to determine the _____ of open well.
j) The unit of specific capacity of a well is _____.
k) The river in which the water flows to its full capacity in rainy season only is known as _____.
l) The canal which is aligned along the watershed line is known as _____.
m) The line joining the places of equal rainfall is known as_____.
n) Crop period is slightly _____ than the base period.
o) The ratio of area irrigated in Rabi season to that irrigated in Kharif season is known as_____.

3. Very short answer type question: (Answer *any ten* questions) (10X1=10)

a) Write the relation between Vase period and Crop period.
b) Write the relationship between precipitation, rainfall and runoff.
c) Write one factors affecting Infiltration Rate.
d) Write the components of runoff.
e) Write one physical factors affecting hydrograph.
f) Define lag time.
g) Write the unit of measurement of direct runoff.
h) Write any one components of aeration zone of ground water.
i) Give one example for aquitard.
j) Write the unit of measurement of specific yield.
k) Write the mathematical expression of Darcy's law:
l) List any one advantages of surface reservoir.
m) Write any one Hydrologic Data that are collected during Groundwater basin investigations.
n) Give one example of Himalayan River.
o) Define Multipurpose Reservoirs.

GROUP-B

4. Large answer type questions: (Answer *any five* questions) (5X2=10)

a) Define Duty.
b) Define deflecting groyne.
c) Write any two assumptions of unit hydrograph.
d) Write two objectives of surface storage work.
e) Write the values of side slopes for a irrigation canal in cutting and filling.
f) Distinguish between any two methods for improving canal irrigation management.
g) Write the amount of crop water requirement for wheat and sugarcane.

GROUP-C

Large answer type questions (Answer *any five* questions) (6X5=30)

5. a) The following are the rates of rainfall (intensity of rainfall) for successive 20 min period of a 140 min storm 2.5, 2.5, 10.0, 7.5, 1.25, 1.25, 5.0 cm/hr. Taking the value of ø -index at 3.2 cm/hr. Find out the net runoff in cm, the total rainfall and the value of W-index. (2+2+2)

6. a) Describe the method of Artificial Recharge through Injection Wells with suitable diagram.
   b) Define specific retention and specific capacity. (4+2)

7. a) Explain zones of ground water with relevant diagram.
   b) Define Dead and Live storage of reservoir. (4+2)

8. a) Classify river training work with example.
   b) Explain reservoir losses. (3+3)

9. a) Explain levees, guide banks and artificial cut-offs methods of river training work. (2+2+2)

10. a) Explain the benefits of Crop Rotation.
    b) Describe the Inter-cropping method of cropping pattern. (4+2)

11. a) An irrigation canal has gross commanded area of 60,000 hectares out of which 85% is culturable irrigable. The intensity of irrigation for Kharif season is 40% and for Rabi season is 50%. Find the discharge required at the head of canal if the duty at its head is 800 hectares/cumec for Kharif season and 1500 hectares/cumec for Rabi season. (6)

12. a) Explain the role of remote sensing and GIS in watershed management.
    b) List three causes of soil erosion. (3+3)
