CS/B.TECH/CE/CVE(O)/ODD/SEM-7/CE-702/2019-20

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Paper Code : CE-702

PUID : 07224 (To be mentioned in the main answer script)

WATER RESOURCE ENGINEERING

Time Allotted : 3 Hours   Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :   10 × 1 = 10

  i) The process of loosing water from the leaves of plants, is termed as

    a) Surface evaporation

    b) Water surface evaporation

    c) Transpiration

    d) Precipitation.

  ii) The maximum depth in soil strata, in which the crop spreads its root system, and derives water from the soil, is called

    a) kor depth   b) root zone depth

    c) delta   d) overlap allowance.

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iii) The commonly used rain gauge is

   a)   weighing bucket type

   b)   tipping bucket type

   c)   float type

   d)   none of these.

iv) Cyclonic precipitation results from

   a)   lifting of air masses converging into low pressure area   http://www.makaut.com

   b)   natural rising of warmer, lighter air in colder and denser surroundings

   c)   lifting of warm moisture-laden air masses due to topographic barriers

   d)   All of these.

v) The duty of a crop is 432 hectares per cumec when the base period of the crop is 100 days. The delta for the crop will be

   a)   100   b)   200

   c)   432   d)   864.

vi) Lacey's Regime theory is not applicable to a canal in

   a)   true regime   b)   initial regime

   c)   final regime   d)   none of these.

vii) The volume of rainfall which produces equal run-off, is called

   a) Point rainfall   b) Effective rainfall

   c) Average rainfall   d) Ground rainfall.

viii) Critical velocity ratio for use in Kennedy's theory is

   a) < 1   b) > 1

   c) equal to 1   d) All of these.

ix) Specific yield for an unconfined aquifer is

   a) > porosity

   b) < porosity

   c) equal to porosity

   d) unrelated to porosity.

x) Darcy's law is valid when the flow is

   a) Laminar

   b) Turbulent

   c) Both (a) and (b)

   d) None of these.

xi) A graph showing variations of discharge with time, at a particular point of a stream is known as

a) mass inflow curve b) logistic curve

c) hydrograph d) none of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. A catchment area has seven rain-gauge stations. In a year the annual rainfalls recorded by the gauges are as follows :

Station	P	Q	R	S	T	U	V
Rainfall (cm)	130·00	142·10	118·20	108·50	165·20	102·10	149·60

For a 5% error in the estimation of the mean rainfall, calculate the minimum number of additional stations required to be established in the catchments.

3. What meant by duty and delta ? Derive the relation between duty and delta for a given base period.

4. The normal annual rainfalls at stations A. B. C and D in a basin are 80·97, 67·59, 76·28, 92·01 cm respectively. In the year 1985, the station D was inoperative and the stations A, B and C recorded annual precipitation of 91, 11, 72·23 and 79·89 cm respectively. Estimate the rainfall at station D in that year.

5. Differentiate between Lacey's Theory and Kennedy's Theory.

6. a) What is meant by regime ? Differentiate between regime in natural rivers and in artificial channel.

   b) What is a canal head regulator ?

GROUP – C
(Long Answer Type Questions)
Answer any three of the following. $3 \times 15 = 45$

7. a) Design an unlined irrigation channel with the following data :

   Discharge of the canal = 24 cumec

   Permissible mean velocity = 0·80 m/sec.

   Bed slope = 1 in 5000

   Side slope = 1:1

   Chezy's constant. C = 44.

   b) Design by Lacey's method a suitable canal section for irrigation to carry a maximum discharge of 82·5 cumecs flowing through fine alluvium. Manning's roughness is 0·02 and the mean country slope is 0·15 per thousand. Assume the canal to be in cutting having a side slope of 1 (H) : 1 (V). Take f = 1·20 for the given material.   5 + 10

8. a) After how many days will you supply water to soil in order to ensure sufficient irrigation of the given crop, if —

    (i) Field Capacity of the soil = 28%

    (ii) Permanent Wilting Point = 13%

    (iii) Dry density of soil = 1·3 gm/c.c.

    (iv) Effective depth of root zone = 70 cm

    (v) Daily consumptive use of water for the given crop = 12 mm.   http://www.makaut.com

Assume any other data, not given.

b) The gross commanded area for a distributary is 6000 hectares. 80% of which is culturable irrigable. The intensity of irrigation for Rabi season is 50% and that for Kharif season is 25%. If the average duty at the head of the distributary is 2000 hectares/cumec for Rabi season and 900 hectares/cumec for Kharif seasons. find out the discharge required at the head of the dstributary from average demand considerations.

                                                          8 + 7

9. a) (i) What is S-curve and what is its significance ?

    (ii) What is flood routing ?

b) The ordinates of a 4-hr unit hydrograph for a particular basin are given below. Derive the ordinates of (i) the S-curve hydrograph and (ii) the 2-hr unit hydrograph, where area of the basin is 630 sq.km.

Time (hr)	0	2	4	6	8	10	12	14	16
Discharge (cumec)	0	25	100	160	190	170	110	70	30

(3 + 2) + 10

10. Design an irrigation channel to carry 6 cumecs of discharge, the critical velocity ratio (m) is 1·0, rugosity coefficient (n) is 0·0225, and bed slope of the channel is 1 in 5000. Use Kennedy's method.

Assume other reasonable data for the design.

11. a) State the various methods for computing run-off depth in a basin.

b) The followings are the rates of rainfall for successive 20 mins period of a 140 mins storm 2·5, 2·5, 10·0, 7·5, 1·25, 1·25 and 5 cm/hr. Taking the value of ϕ_{index} - 3·2cm/hr. Find out the (i) net runoff in cm (ii) total rainfall and (iii) the value of W_{index}.

5 + 10