Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.TECH(CE)/SEM-6/CE-605/2012

2012

WATER RESOURCE ENGINEERING – I

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 :

$10 \times 1 = 10$

　　i)　Mean annual rainfall is usually calculated by taking the simple average of total rainfall of several consecutive years. Normally, how many years average is taken for a better result ?

　　　　a)　50 years　　　　　b)　35 years

　　　　c)　25 years　　　　　d)　10 years.

　　ii)　The line on which every point has the same evapo-transpiration is called

　　　　a)　contour　　　　　b)　isohyets

　　　　c)　isobars　　　　　d)　isopleths.

6410　　　　　　　　　　　　　　　　　　　　[Turn over

iii) Runoff is generated when

    a)   evaporation has stopped

    b)   rainfall starts

    c)   rainfall exceeds the infiltration capacity

    d)   wind speed exceeds a limit.

iv) Under what conditions surface runoff becomes equal to the rainfall ?

    a)   They never becomes equal

    b)   They become equal when infiltration becomes zero

    c)   They becomes almost equal when, infiltration and evapotranspiration becomes zero.

v) Hirakud Dam in Orissa is one of the longest dam in the world. Its length is

    a)   7 km   b)   59 km

    c)   26 km   d)   44 km.

vi) The Pan coefficient is defined as

    a) $\dfrac{E}{E_p}$ b) $\dfrac{E_p}{E}$

    c) $E_p - E$ d) $E_p . E$.

vii) According to Dicken's formula for estimating floods, the peak discharge is proportional to

    a) A b) $A^{\frac{1}{2}}$

    c) $A^{\frac{2}{3}}$ d) $A^{\frac{5}{3}}$.
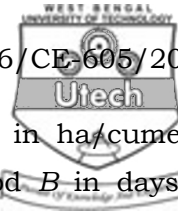
viii) The relationship between the duty 'D' in ha/cumecs, water depth Δ in cm, and base period B in days is given by

a) $D = \dfrac{864\,D}{\Delta}$

b) $D = \dfrac{8 \cdot 64\,B}{\Delta}$

c) $D = \dfrac{8 \cdot 64\,\Delta}{B}$

d) $D = \dfrac{864\,\Delta}{B}$.

ix) Runoff can be estimated by

a) infiltration method

b) unit hydrograph

c) rational method

d) any of these.

x) A lined alluvial canal is best designed on the basis of

a) Lacey's formula

b) Kenneydy's formula

c) Manning's formula

d) Continuity equation.

xi) Delta crop means

a) area under the crop

b) crop period

c) depth of water required by the crop

d) crop production.

xii) Catchment area of a river is bounded by

a) Heist contour line

b) Tributary of the river

c) Watershed line

d) none of these.

xiii) The chart removed from a recording type rain gauge gives

a) the rainfall hyetograph

b) an Iso-hytal map

c) a rainfall mass curve

d) an intensity duration curve.

GROUP – B

(Short Answer Type Questions)

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

2. A river valley consists of 14 hectare of irrigable land to be used for growing a crop whose peak consumptive use is 5 mm / day. If the average daily precipitation on the valley is 20 mm/day of which 2·0 mm is available for the crop and irrigation system is operated for 12 hrs a day, determine the discharge in the irrigation stream if field irrigation efficiency is 50%.

3. a) What are field capacity and permanent wilting point ?

   b) Following velocities were recorded in a stream with a current meter.

Depth above bed (m)	0	1	2	3	4
Velocity (m/sec)	0	0·5	0·7	0·8	0·8

   Find the discharge per unit width of stream near the point of measurement. Depth of flow at the point was 5 m.

4. a) What are the runoff characteristics of streams ?

   b) For a catchment in UP, India, the mean monthly rainfall and temperatures are given. Calculate the annual runoff and runoff coefficient by Khosla's formula.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp(°C)	12	16	21	27	31	34	31	29	28	29	19	14
Rainfall(cm)	4	4	2	0	2	12	32	29	16	2	1	2

5. a)   What are paleo irrigation and Kor-watering ?

    b)   Determine the consumptive use and net irrigation requirement for Jower sown at Bellary (Karnataka) from the following data :

Dates and period of growth	Pan evaporation E_p or P_e in cm	Consumptive use coefficient (K)	Effective precipitation in cm
Oct 16-31	8·49	0·44	3·42
Nov 1-30	15·57	0·54	2·19
Dec 1-31	16·59	0·94	0·54
Jan 1-31	19·10	0·99	0·15
Feb 1-2	1·54	0·73	0·02

6.   What is meant by rain gauges and their uses ? The isohytes for annual rainfall over a catchment basin were drawn. The areas of the strips b/w the isohytes indicated in table. Find the average depth of annual precipitation over the basin.

Isohytes (cm)	Area in sq.km	Isohytes (cm)	Area in sq.km
75-85	580	105-115	1000
85-95	2960	115-135	610
95-105	2850	135-155	160

7.   What do you mean by initial regime, final regime and permanent regime ?

8.   Briefly explain the various types of canal lining.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

9. a) The ordinates of a 3 hour unit hydrograph are given below :

Time in hour	0	03	06	09	12	15	18	21	24	27	30
Ordinate m³/sec i.e. cumec	0	10	25	20	16	12	09	07	08	03	00

Find the ordinates of a 6 hour unit hydrograph for the same.

b) How will you prepare a unit hydrograph for an isolated storm ?

10. a) Discuss the isohietal method for estimating the average rainfall over catchments.

b) The following are the rates of rainfall for successive 20 minutes period of an 140 minutes storm. 2·5, 3·5, 10·00, 7·5, 5·25, 1·25, 5·0 cm per hour, taking the value of as cm per hour, 4·2. Find out the value of w index and runoff coefficient.

11. Locations of rain gauge stations on a river basin *A, B, C, D, E, F* is forming a regular hexagon of side 5 km. Rainfall recorded in each of them are as follows :

St^{n-}	A	B	C	D	E	F
Rainfall in cm	4·6	3·9	6·9	10·6	12·7	4·2

Calculate the mean rainfall by Thiessen Polygon method and Arithmetic mean method.

12. a) What are different methods of determining rate of evaporation ? Describe any one method with sketches.

   b) There are 4 rain gauge stations existing in a catchment area. The value of annual rainfall in rain gauge these St^n are 900 mm, 540 mm, 700 mm and 450 mm. Determine the optimum no. of rain gauge St^n if desired Limit of error is 5%. How more number of St^n to be added ?

13. Write short notes on any *three* of the following :

   a) Hydrological cycle

   b) Moving Average Annual Rainfall curve

   c) Characteristics of Precipitation

   d) Unit hydrograph

   e) Stage Discharge curve.

14. a) Design a regime channel to carry a discharge of 50 cumecs and slit factor 1·1 using Lacey's theory. Side slope of channel is $\frac{1}{2}$: 1.

   b) Compare Kennedy's and Lacey's slit theories.

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