GOVERNMENT COLLEGE OF ENGINEERING, JALGAON

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Name of Examination : **Winter 2020** - (Preview)

Course Code & Course Name : **CE402 - Water Resources Engineering-I**

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Maximum Marks : **60**   Duration : **3 Hrs**

Edit   Print   View Answer Key   Close   **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. *All questions are compulsory. Each question carries two sub-questions and each sub-question carries 06 marks.*
2. *Illustrate your answer with suitable figures/sketches wherever necessary.*
3. *Assume suitable additional data; if required.*
4. *Use of logarithmic table, drawing instruments and non programmable calculators is allowed.*
5. *Figures to the right indicate full marks.*

1) a) Define "yield" of a catchment. Discuss any five empirical equations for determining the yield.   [6]

b) A culvert is to be designed for drainage at the outlet of a catchment for a return period of 25 years. The slope of the catchment (S) is 0.006 and its area is 85 ha. The maximum length of travel of water (L) is 950 m. The maximum depth of rainfall, with a 25 - year return period, is given in following table. Determine the peak discharge by rational method, assuming runoff coefficient = 0.30. Use following Kirpich equation for calculating the time of concentration (t_C).   [6]

$$t_C = 0.01947\ L^{0.77}\ S^{-0.385}$$

Duration (minutes)	5	10	20	30	40	50
Rainfall depth (mm)	17	26	40	50	57	62

2) a) A flood hydrograph due to 03 successive storms of 2.9 cm, 4.9 cm and 3.9 cm, each of 6 hour duration, is given below. Derive the 6 - h unit hydrograph, assuming phi ($\varnothing$) index of 0.15 cm/h and constant base flow of 20 m^3/s.   [6]

Time (h)	0	3	6	9	12	15
Q (m^3/s)	20	70	240	555	820	830
Time (h)	18	21	24	27	30	33
Q (m^3/s)	610	390	210	85	35	20

b) A storm had the rainfall excess of 2.5 cm, 4 cm and 2 cm in three successive intervals, each of 3 hour duration. Assuming a constant base flow of 13 m^3/s, derive the flood hydrograph using following unit hydrograph.   [6]

Time (h)	0	3	6	9	12	15
Q (m^3/s)	0	20	60	150	120	90
Time (h)	18	21	24	27	30	33
Q (m^3/s)	66	50	32	20	10	0

OR

Derive the S - curve from following 4 - h unit hydrograph and draw a neat sketch of the S - curve on answer paper itself (graph paper not required), showing the equilibrium discharge and the corresponding time.

Time (h)	0	4	8	12	16	20	24	28
Q (cumec)	0	10	30	25	18	10	5	0

3) a) Determine the discharge from a tube well, penetrating fully an unconfined aquifer, using following data.   [6]

Diameter of well = 25 cm, drawdown in the well = 3 m, length of strainer = 10.6 m, radius of influence = 300 m, permeability = 0.50 mm/s.

OR

Define and explain following terms with respect to ground water hydrology.

(i) specific yield of an aquifer, (ii) specific capacity of a well, (iii) well loss and (iv) transmissibility of an aquifer.

b) Explain water logging and describe any six important causes of water logging.   [6]

4) a) Suggest the best alternative from following three proposals, assuming 10 % rate of interest in all the cases.	[6]

Sr. No.	Item	Proposal I	Proposal II	Proposal III
1	Capital cost (Crore Rs.)	150	200	250
2	Annual OMR cost (Crore Rs.)	9	12	13
3	Annual benefits (Crore Rs.)	30	40	45
4	Working life (years)	32	50	72

b) The relation between the trap efficiency and capacity inflow ratio for a reservoir is given in following table. The annual flood inflow is 60 Mm^3 and average annual sediment	[6]
inflow, having specific gravity 1.15, is 0.30 million tonnes. Determine the probable life of the reservoir having an initial capacity of 30 Mm^3. The useful life of the reservoir
will terminate when 80 % of initial capacity is filled with the sediment.

Capacity inflow ratio	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90
trap efficiency	87	93	95	95.5	96	96.5	97	97.2	97.3

5) a) State and explain the various surface irrigation methods.	[6]
OR
Find the field capacity of the soil for following data.
Depth of root zone = 2 m, existing water content = 6.5 %, dry density of soil = 1500 kg/m^3, water applied to the soil = 600 m^3, area of the land irrigated = 1000 m^2, water
lost due to evaporation and deep percolation = 12 %.

b) Calculate the watering interval, that is, the frequency of watering for following data.	[6]
Field capacity of the soil = 30 %, permanent wilting point = 15 %, specific gravity of soil = 1.4, effective root zone depth = 75 cm, daily consumptive use of water for the
given crop = 12 mm.
For healthy growth of the crop, the readily available moisture should be 75 % of the total available moisture.

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