KATHMANDU UNIVERSITY
End Semester Examination [C]
December, 2018

Marks Scored:

Level : B. E
Year : II

Course : CIEG 206
Semester: II

Exam Roll No.: Time: 30 mins. F.M. : 10

Registration No.: Date DEC 30 2018

SECTION "A"
[20 Q. × 0.5 = 10]

Tick (✓) the most appropriate answer

1. If for a given basin in a given period, P= Precipitation, E= Evaporation, R= Total runoff and ΔS= increase in storage of water in the basin, the hydrological water budget equation states
   a. $P = R - E \pm \Delta S$ b. $R = P + E - \Delta S$ c. $P = R + E + \Delta S$ d. $P + R + E + \Delta S = 0$

2. The surface velocity at any vertical section of a stream is
   a. Not of any use in stream flow measurement
   b. Smaller than the mean velocity in that vertical
   c. Larger than the mean velocity in that vertical section
   d. Equal to the velocity in that vertical at 0.6 times the depth

3. The St. Venant equations for unsteady open-channel flow are
   a. Continuity and momentum equations
   b. Momentum equations in two different forms
   c. Momentum and energy equations
   d. Energy equations

4. For a given stream the rating curve applicable to a section is available. To determine the discharge in this stream, the following data are needed
   a. Current meter readings at various verticals at the section
   b. Slope of the water surface at the section
   c. Stage at the section
   d. Surface velocity at various sections

5. Base-flow separation is performed
   a. On a unit hydrograph to get the direct-runoff hydrograph
   b. On a flood hydrograph to obtain the magnitude of effective rainfall
   c. On flood hydrographs to obtain the rainfall hydrograph
   d. On hydrograph of effluent streams only

6. The probability that a hundred year flood may not occur at all during the 50 year life of the project is
   a. 0.395 b. 0.990 c. 0.605 d. 0.133

7. For a return period of 100 years the Gumbel's reduced variate Y_t is
   a. – 4.6 b. 4.6 c. 0.517 d. 1.2835

8. The dilution method of stream gauging is ideally suited for measuring discharges in
   a. A large alluvial river
   b. Flood flow in a mountain stream
   c. Steady flow in a small turbulent stream
   d. A stretch of a river having heavy industrial pollution loads

9. What does "hydrograph" mean?
   a. Variations in discharge overtime
   b. Variations in snowfall overtime
   c. Variations in water temperature against discharge
   d. Variations in sediment concentration against river discharge

10. The ratio of radiation reflected by a surface to the radiation received by it is called its
   a. Radiation coefficient
   b. Absorption coefficient
   c. Albedo
   d. Bowen ratio

11. Thiessen polygons are drawn by
   a. Joining the rain gauge stations
   b. Drawing perpendicular of lines joining rain gauge station
   c. Drawing lines of equal elevations
   d. Drawing lines of equal precipitation

12. Instantaneous unit hydrograph is a hydrograph of
   a. Unit duration and infinitely small rainfall excess
   b. Infinitely small duration and of unit rainfall excess
   c. Zero effectively precipitation
   d. Zero frequency

13. While calculating the optimum number of stations in a watershed, the allowable error for estimation of rainfall is generally taken as
   a. 10 % b. 8 % c. 4 % d. 25 %

14. The infiltrated water divided by the effective time period of rainfall gives the value of
   a. Basic index rate b. Infiltration rate c. Φ index d. Initial abstraction

15. The rational method used for the computation of the runoff from a watershed gives
   a. Runoff volume
   b. Runoff rate
   c. Discharge rate at channel
   d. Peak runoff rate

16. The time of translation of the flow from the most remote point of drainage basin to its outlet is equal to that of
   a. Overland flow
   b. Time of concentration
   c. Lag time
   d. Rainfall duration

17. The time base of hydrograph increases with
   a. Increase in intensity of the storm
   b. Decrease in intensity of storm
   c. Increase in time of concentration
   d. Decrease infiltration capacity of the storm

18. In Gumbel's distribution, the relation between variate y and the return period T is given by
   a. $e^{-e^{-y}} = 1-(1/T)$ b. $e^{-e^{-y}} = 1/T$ c. $e^{-e^{-y}} = 1+(1/T)$ d. $e^{-e^{-y}} = (1/T)-1$

19. An aquifer which is underlain by an impermeable layer at the bottom and not confined at the top is known as
   a. Confined aquifer
   b. Unconfined aquifer
   c. Semi confined aquifer
   d. Perched aquifer

20. The yield of well depends upon
   a. Permeability of soil
   b. Area of aquifer opening in to the wells
   c. Actual flow velocity
   d. Volume of soil

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SECTION "B"

Make suitable assumptions when needed. The figures in the parenthesis indicate the marks allocated for the question.

1. What is flow duration curve? What information can be gathered from the study of the flow duration curve of a stream at a site? [3]

2. Given the following data for a stream gauging operation in a river, compute discharge [5]

Distance from left bank (m)	Depth (m)	Velocity (m/s)	
		At 0.2d	At 0.8d
0	-	-	-
1.5	1.3	0.6	0.4
3	2.5	0.9	0.6
4.5	1.7	0.7	0.5
6	1	0.6	0.4
7.5	0.4	0.4	0.3
9	-	-	-

3. Distinguish between [3 × 2 = 6]
   a. Hyetograph and Hydrograph
   b. Hydraulic and hydrologic method of flood routing
   c. Aquifer and Aquitard

4. The ordinates of a 4 hour UH of a basin of area 25 km^2 are given below [3]

Time(h)	0	4	8	12	16	20	24	28	32	36	40	44	48	52
UH(m^3/s)	0	30	55	90	130	170	180	160	110	60	35	20	8	0

Calculate 4-hr DRH for a rainfall of 3.25 cm with ø index of 0.25cm

5. A catchment of area 120 ha has a time of concentration of 30 min and runoff coefficient of 0.3. If a storm of duration 45 min result in 3cm of rain over the catchment, estimate the resulting peak flow rate. [3]

6. What do you understand by design flood? What are the methods to estimate design flood? How flood can be mitigated? [4]

7. What is ground water? Derive an expression for yield from a confined well. [4]

8. The following peak discharge represents the annual maximum flows for the Bagmati river at Karmaiya for the year 1961 to 1975

Year	1961	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Peak discharge (m^3/s)	4510	7060	4550	3500	3420	3800	2740	3650	4350	2660	8030	3090	4080	2930	2 0

Calculate the 100 year flood assuming Gumbel distribution. [5]

9. Describe various methods of sampling of bed load and suspended sediments. [4]

10. A catchment has seven rain gauge stations. In a year, the annual rainfalls in cm recorded by the gauges are as follows: 130, 142.1, 118.2, 108.5, 165.2, 102.1, and 146.9. For a 5% error in the estimation of the mean rainfall, calculate the minimum number of additional stations required to be established in the catchment. [3]

OR

A small catchment of area 150 ha received a rainfall of 10.5 cm in 90 minutes due to a storm. At the outlet of the catchment, the stream draining the catchment was dry before the storm and experiences a runoff lasting for 10 hours with an average discharge value of 2 m^3/s . The stream was again dry after the runoff event. a) What is the amount of water which was not available to runoff due to combined effect of infiltration and transpiration? b) What is the ratio of runoff to precipitation?

TABLE 7.3 REDUCED MEAN $\bar{y}_n$ IN GUMBEL'S EXTREME VALUE DISTRIBUTION

N = sample size

N	0	1	2	3	4	5	6	7	8	9
10	0.4952	0.4996	0.5035	0.5070	0.5100	0.5128	0.5157	0.5181	0.5202	0.5220
20	0.5236	0.5252	0.5268	0.5283	0.5296	0.5309	0.5320	0.5332	0.5343	0.5353
30	0.5362	0.5371	0.5380	0.5388	0.5396	0.5402	0.5410	0.5418	0.5424	0.5430
40	0.5436	0.5442	0.5448	0.5453	0.5458	0.5463	0.5468	0.5473	0.5477	0.5481
50	0.5485	0.5489	0.5493	0.5497	0.5501	0.5504	0.5508	0.5511	0.5515	0.5518
60	0.5521	0.5524	0.5527	0.5530	0.5533	0.5535	0.5538	0.5540	0.5543	0.5545
70	0.5548	0.5550	0.5552	0.5555	0.5557	0.5559	0.5561	0.5563	0.5565	0.5567
80	0.5569	0.5570	0.5572	0.5574	0.5576	0.5578	0.5580	0.5581	0.5583	0.5585
90	0.5586	0.5587	0.5589	0.5591	0.5592	0.5593	0.5595	0.5596	0.5598	0.5599
100	0.5600									

TABLE 7.4 REDUCED STANDARD DEVIATION S_n IN GUMBEL'S EXTREME VALUE DISTRIBUTION

N = sample size

N	0	1	2	3	4	5	6	7	8	9
10	0.9496	0.9676	0.9833	0.9971	1.0095	1.0206	1.0316	1.0411	1.0493	1.0565
20	1.0628	1.0696	1.0754	1.0811	1.0864	1.0915	1.0961	1.1004	1.1047	1.1086
30	1.1124	1.1159	1.1193	1.1226	1.1255	1.1285	1.1313	1.1339	1.1363	1.1388
40	1.1413	1.1436	1.1458	1.1480	1.1499	1.1519	1.1538	1.1557	1.1574	1.1590
50	1.1607	1.1623	1.1638	1.1658	1.1667	1.1681	1.1696	1.1708	1.1721	1.1734
60	1.1747	1.1759	1.1770	1.1782	1.1793	1.1803	1.1814	1.1824	1.1834	1.1844
70	1.1854	1.1863	1.1873	1.1881	1.1890	1.1898	1.1906	1.1915	1.1923	1.1930
80	1.1938	1.1945	1.1953	1.1959	1.1967	1.1973	1.1980	1.1987	1.1994	1.2001
90	1.2007	1.2013	1.2020	1.2026	1.2032	1.2038	1.2044	1.2049	1.2055	1.2060
100	1.2065									