B.E. CONSTRUCTION ENGINEERING SECOND YEAR FIRST SEMESTER - 2018

Subject : WATER RESOURCES ENGINEERING   Time : Three hours   Full Marks : 100

PART-I

Instructions:
1. Answer any **TWO** questions.
2. Illustrate your answers with neat sketches wherever necessary.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.
5. Preferably, write the answers in sequential order.

1. (a) The BOD of a sewage incubated for one day at 30°C has been found to be 100mg/l. What will be the 5 day 20°C BOD? Assume K = 0.12 (Base 10) at 20°C. (5)

(b) Draw a neat sketch of trickling Filter and label the part. Mention the merits of trickling Filter. (10)

©Explain the flow diagram employed for a conventional water treatment plant. Indicate the importance of each unit indicated in the flow diagram. (10)

2. (a) Deduce an expression for determining BOD at any time. (5)

(b) Draw a flow diagram from an outfall to the disposal into a river valley after complete treatment for a proposed sanitary project for a town. Indicate the purpose of each unit adopted during the process treatment. (10)

© Explain the need for providing sewer appurtenances in sewerage system. (5)

(d) What is Manholes? Explain the need of manhole. Draw neat sketch of deep manhole. (5)

3. (a) Explain the biological treatment techniques for treating waste-water OR Activated Sludge Process. (8)

(b) Design a sewer running 0.7 times full at maximum discharge for a town provided with the separate system, serving a population 80,000 persons. The water supplied from the water works to the town is at a rate of 190 LPCD. The manning's n = 0.013 for the pipe material and

permissible slope is 1 in 600. Variation of n with depth may be neglected. Check for minimum and maximum velocity assuming minimum flow 1/3 of average flow and maximum flow as 3 times the average. (for d/D = 0.7, q/Q = 0.838, v/V = 1.12). (10)

© Write short notes on any four of the following with neat sketches: (Any Two) (3.5x2 =7)

    (i) Inverted syphon.

    (iii) Lamp hole.

    (iv) C.O.D

    (v) Population Equivalent.

    (vi) TOC.

Answer Q. No. 1 and any two from the rest.

1. a) Write **TRUE** or **FALSE**:

   1 x 5

   a) The coefficient of variation in connection with the optimum number of rain gauges is directly proportional to the sample standard deviation.

   b) For determining the mean rainfall over a drainage basin, there are two conventional methods.

   c) In case of moderate rain of uniform intensity, the W_{index} will be higher than Φ_{index}.

   d) The ordinates of the storm hydrograph are obtained by dividing those of the unit hydrograph by a factor.

   e) In order to obtain the surface runoff graph from the runoff hydrograph, the base flow is not required.

   b) Write short notes on the following:

   1 x 5

   i) Stage vs. discharge relationship

   ii) W_{index} and φ_{index}

   iii) Meteorologically homogeneous stations

   iv) Shape of catchment area

   v) Run-off and base flow

2. a) Explain the infiltration capacity curve with a neat sketch. What is its equation?

   b) Deduce an expression for the gradient of this curve when expressed in log-log scale.

   c) There are four rain gauge stations existing in the catchment of a river. The average annual rainfall values at these stations are 800, 620, 400 and 540 mm respectively. (i) Determine the optimum number of rain gauges in the catchment, if it is desired to limit the error in the mean value of rainfall in the catchment to 10%. (ii) How many more gauges will then be required to be installed?

   5+5+10

3.   a) What do you mean by W_{index} and Φ_{index} ? Explain giving suitable sketches wherever necessary.

b) The following are the rates of rainfall for successive 20 minutes period of a 140 minutes storm: 2.5, 2.5, 10.0, 7.5, 1.25, 1.25, 5.0 cm/hr. Taking the value of Φ_{index} as 3.2cm/hr, find out the net runoff in cm, the total rainfall and the value of W_{index} .   5 + 15

4.   a) Explain the various methods for finding the missing rainfall data.

b) In a typical 4 hr. storm producing 50mm of excess rain from a basin, the following flows in the stream, are recorded:

Time in hours	Flow in cumecs
0	0.0
2	1.22
4	4.05
6	6.75
8	5.67
12	3.375
16	1.35
20	0.0

a) Plot the unit hydrograph of run off for this storm.

b) Estimate, as accurately as possible, the peak flow and the time of its occurrence, in a flood created by a 8 hours storm, which produces 2.5cm of effective rainfall during the first 4 hours and 3.75 cm of effective rainfall during the second 4 hours. Assume the base flow to be negligible.   5 + 15