FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI.
SCHOOL OF ENGINEERING AND ENGINEERING TECHNOLOGY
DEPARTMENT OF AGRICULTURAL AND BIORESOURCES ENGINEERING
HARMATTAN SEMESTER EXAMINATION   2019/2020 SESSION
COURSE: SWE 503 – PRINCIPLES OF IRRIGATION   TIME: 3HOURS
INSTRUCTION: ANSWER ANY FIVE QUESTIONS

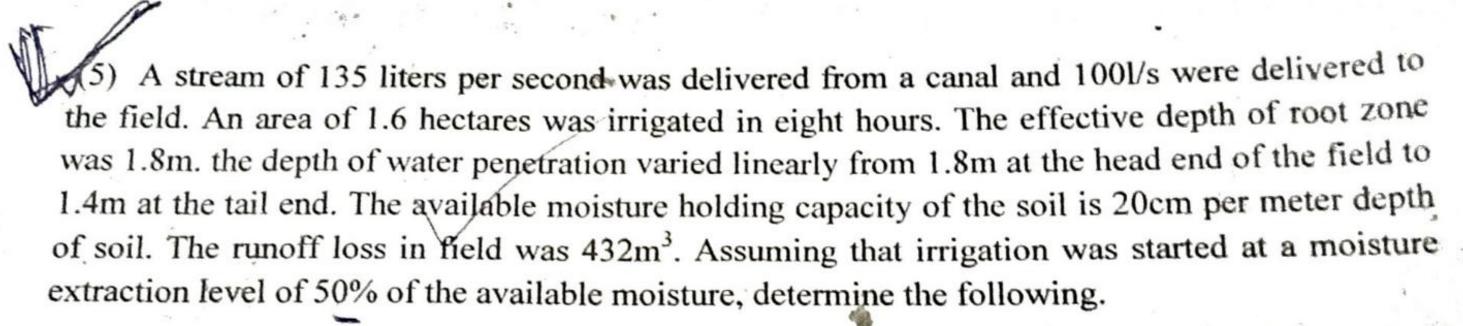1(a) write short notes on the following as sources of water to plant other than irrigation
   (i)   Precipitation (ii) atmospheric water other than precipitation
   (ii)   Flood water (iv) Ground water
(b) Write short notes on the following irrigation water reservoirs:
   (i)   Dug-out pond
   (ii)   On-Stream pound
   (iii)   Off-stream pond

2 (a) What is sprinkler irrigation?
 (b)) Determine the required capacity of a sprinkler system to apply water at the rate of 1.35cm/hr. two long sprinkler lines are required. 32 sprinklers are spaced at 12m intervals on each line. The spacing between line is 18m.

3 (a) Explain Evapotranspiration?
(b) State four factors that affect evapotranspiration. Also explain how the factors you mentioned affect evapotranspiration.

4 (a) The following data were obtained in determining the moisture content at successive depths in the root zone prior to applying irrigation water.

DEPTH OF SAMPLING (cm)	Wt of Moist soil sample (g)	Given dry wt of soil sample
0 – 25	134.60	126.82
25 – 50	136.28	127.95
50 – 75	122.95	115.32
75 – 100	110.92	102.64

The bulk density of the soil in the root zone was 1.50g/cc. the available moisture holding capacity of the soil was 17.8cm/m depth. Determine

   (i)   The moisture content at the different depths in the root zone.
   (ii)   Moisture content in the root zone at the time of irrigation
   (iii)   Net depth of water to be applied to bring the moisture content to field capacity
   (iv)   Gross irrigation requirement at an estimated field irrigation efficiency of 70%.

(5) A stream of 135 liters per second was delivered from a canal and 100l/s were delivered to the field. An area of 1.6 hectares was irrigated in eight hours. The effective depth of root zone was 1.8m. the depth of water penetration varied linearly from 1.8m at the head end of the field to 1.4m at the tail end. The available moisture holding capacity of the soil is 20cm per meter depth of soil. The runoff loss in field was 432m³. Assuming that irrigation was started at a moisture extraction level of 50% of the available moisture, determine the following.

(i) Water conveyance efficiency   (ii) Water application efficiency

(iii) Water storage efficiency   (iv) Water distribution efficiency

6. The root zone of a crop in a soil has a field capacity of 40% and a permanent wilting point of 10%. Determine:

(a) The depth of moisture in the rootzone per meter of the field capacity and the permanent wilting point.

(b) The depth of water in (a) above if the rootzone depth is 1.3m. (take unit weight of soil as 15KN/m³)

$$\frac{WF}{wd} \times 100 \quad 2)\ \frac{100}{135} \times 100$$

$$= 74.10\%$$

Water application efficiency

$$E_y = \frac{WS}{Df} \times 100\%$$

$$WS = WF \times (2) \quad 3)\ 100 \times 8 \times 3600$$

$$\frac{W_f}{wd} = \frac{100}{135}$$

Wind ct affects E' by removing water molecules in air & temp. of air capable