14/05/19

Roll No. | | | | | | | | | | |

B.E. / B.Tech. (Full Time) ARREAR EXAMINATIONS, Apr / May 2019

AGRICULTURAL AND IRRIGATION ENGINEERING

Seventh Semester

AI 8009 Minor Irrigation and Command Area Development

(Regulation 2012)

Time: 3 hrs

Answer ALL Questions

Max Marks: 100

Part – A (10 x 2 = 20 Marks)

1) What are the issues in minor irrigation sector addressed in XI plan?
2) Write the different irrigation schemes with respect to CCA.
3) Write a note on groundwater market.
4) List the merits and demerits of tube well irrigation.
5) Differentiate *division box* and *diversion box* in CAD.
6) Draw the sketch of a bund with rear berm and write a note on it.
7) Define *project efficiency* and how is it calculated?
8) List the salient features of PIM.
9) What are the improvements in National Water Policy 2012 compared to the older one?
10) Can water pricing improve irrigation efficiency? Substantiate.



Part – B (5 x 16 = 80 Marks)
(Question No. 11 is compulsory)

11. a) i) What is meant by silt factor? Discuss its importance in design of canals. (5)

b) i) Design a most economical trapezoidal section of a canal having the following data. Discharge of the canal = 2.0 cumecs, permissible mean velocity = 0.85 m/s, Bazins's constant (K) = 1.3, side slope of canal = 1½:1. Also find the allowable bed slope of the canal. (11)

12) a) i) Design a tube well for 0.07 cumec discharge, given that, at a drawdown of 3.75m, the water table varies between 25m to 35m during winter and summer respectively. Take R=275m. The hydraulic conductivity K= $4.25\times10^{-4}$ m/s. Lithology of the well is as follows:

| DEPTH | 0-4m | 4-12m | 12-24m | 24-34m | 34-50m | 50-65m | Below 65m |
|---|---|---|---|---|---|---|---|
| STRATA | Clay | Very fine sand | Clay and kankar | Coarse sand | Clay | Medium sand | Clay |

(OR)

b) i) Briefly discuss the different types of tube wells.

13. a) From the topographical map, the areas enclosed within the contour lines and along the phase of a proposed pond are given below.
Maximum water level = +93.25, full tank level =+92.80, sill level of the deepest sluice = +91.30, deep bed level =+ 91.00 (all in metres).
i) Calculate the volume at the FTL using trapezoidal and prismoidal formula.
ii) Find the storage capacity at MWL and FTL from the depth vs storage capacity curve to be plotted.

| CONTOUR | 91 | 91.3 | 91.6 | 91.9 | 92.2 | 92.5 | 92.8 | 93.1 | 93.4 |
|---|---|---|---|---|---|---|---|---|---|
| AREA ($m^2$) | 0 | 215 | 797 | 1969 | 3019 | 4075 | 4780 | 5417 | 6050 |

(OR)

b) i) Explain the types of tank bunds and the criteria for their safe design. (6)

ii) Design a tank bund for a small tank which has its deep bed level at +99.50 and FTL at +102.50m. The soil at the site is clay.
Note that tank bund is usually designed for a saturation gradient of 1 in 3 for clay soil. Depth of deep bed level below FTL = 3.00m
For small tanks, the following values can be adopted.
MWL= 0.60 m above FTL, free board = 1.2m, top width of the bund (T) = 3.00m (where a cart track is to be taken) or 1.5m in other cases, side slopes S1 = 1½:1 on front side and S2 = 2:1 on rear side. (10)



14) a) i) Explain the general approach for design and execution of OFD works.

(OR)

b) i) Design a drainage channel which outfalls into a tidal river with the following data.
Catchment area = 15 $km^2$ out of which 10 $km^2$ is rural (C=0.3) and 5 $km^2$ is semi-urban (C=0.5). Storm duration = 60 minutes, tide lockage period = 8 hrs, coefficient of Rugosity (N) = 0.025, available longitudinal slope = 15 cm / km. Assume any other relevant data if required.

15) a) i) Define the following water productivities and methods to improve the same.
i) Plant scale water productivity
ii) Field scale water productivity
iii) Project scale water productivity
iv) Crop water productivity

(OR)

b) i) What causes the development of saline and alkaline soils? Discuss the suitable preventive measures. (10)

ii) What causes irrigation conflicts and suggest suitable measures to resolve them? (6)