2016

IRRIGATION ENGINEERING

Paper : CE 716

Full Marks : 100

Time : Three hours

**The figures in the margin indicate
full marks for the questions.**

Answer **any five** questions.

1. *(a)* Calculate the bed width for an irrigation channel to carry a discharge of 5 *cumec*. Side slope of the channel is ½ horizontal to 1 vertical. Assume critical velocity ratio as 0·8. Take 1st trial depth of flow as 1 *m*. the channel has a bed slope of 2 *m*. per kilometre. Using

   Kutter's equation $V = C\sqrt{RS}$ check the depth. The value of C for the given condition is computed as 30, V is the mean velocity of flow in *m/sec* and R is the hydraulic mean radius in *metre*.

10

(b) Design a lined canal to carry 100 m^3/sec on a slope of 1 in 2500. The maximum permissible velocity is 2 m/sec, $n = 0.013$ in Manning's formula and the side slope = $1.25H : 1.0V$.

10

2. *(a)* Discuss with neat sketches, the different types of cross drainage work.

10

(b) Describe briefly the various methods of lining irrigation canal. Give a cross-section of a lined canal.

10

3. *(a)* In Khosla's theory how is the exit gradient of a weir in permeable foundation estimated. Using the theory how can the factor of safety of a weir design against piping to be estimated.

10

(b) Why are canal falls provided in irrigation channels ? With the help of sketches, describe and illustrate a trapezoidal notch fall.

10

4. (a) A trapezoidal irrigation cannal with side slope of $1.5H$ to $1V$ is proposed to be lined with bricks to reduce seepage losses. It is required to carry a discharge of 29 m^3/sec of water. Find the wetted perimeter for minimum amount of lining and the required bed slope. The value of Manning's N is given as 0.015 and it is stipulated that the average velocity cannot exceed 1 m/sec.   10

(b) Show with the help of diagrams the component parts of an irrigation canal system and briefly mention their respective functions.   10

5. (a) Using Lacey's diagram, design irrigation channel for the following data :   10

Discharge θ = 50 *cumecs*

Silt factor f = 1

Size Slope = ½ : 1

(b) State and explain the functions of upstream and downstream piles of a barrage. How are their depth decided ?
                    10

6. Design a syphon aqueduct if the following data at the crossing of a canal and drainage are given : 20

Discharge of canal = 40 m^3/sec, Bed width = 30 m full supply depth of canal = 1·6 m

Bed level of canal = 206·4 m, Side slope of canal = 1½H:1V

High flood discharge of drainage = 450 cumecs

High flood level of drainage = 207·0 m

Bed level of drainage = 204·5 m

General ground level = 206·5 m