Roll No.										

B.E. (FULL TIME) DEGREE END SEMESTER EXAMINATIONS, MAY 2013

(1)

BE AGRICULTURAL AND IRRIGATION ENGINEERING
Sixth Semester

AI 9354 SYSTEMS ANALYSIS IN IRRIGATION ENGINEERING

(Regulation 2008)

Time: 3 Hours Maximum: 100 marks

Answer All Questions

PART – A (10 x 2 = 20 Marks)

1. What are the characteristics of a system?
2. Differentiate between purposive and non-purposive system.
3. What is parametric sensitivity analysis?
4. List the methods used in optimization of a reservoir release
5. Write a suitable example for stage variable and state variable?
6. Define multi objective function in optimization model?
7. What is meant by stream flow simulation?
8. Sketch the diagram for representing standard operating rule curve?
9. Define linear decision rule (LDR).
10. What are the types of goal programming for solving irrigation release optimization?

PART – B (5 x 16 = 80 Marks)

11.a) (i) Explain briefly with sketch about weighted goal programming in reservoir optimization problem. (6)

(ii) With the linear decision rule $R_t = S_t + (1\text{-}0.3)Q_t - b_t$. Obtain the deterministic equivalent of the storage chance constraint, $P(S_t \leq K) \leq 0.9$. Assume that the flows Q_t follows the cumulative distribution function given by

$$F(q) = 1 - e^{-\beta q}$$

Write down the deterministic equivalent for a two period (t=1 and 2) problem when $\beta = 3$, K is the reservoir capacity. Neglect Evaporation and seepage loss. (10)

12.a)(i) Write short notes on Black Box model with suitable example in irrigation and agricultural engineering. (8)

(ii) Draw the components of irrigation systems and also explain briefly the basic characteristics of each component? (8)

(OR)

12.b)(i) Explain briefly various steps to be followed in system analysis. (8)

(ii) Explain with diagram of a distributed system and lumped system. (8)

...P.T.O.

13.a) Two crops are grown on a farm of 200 ha. The cost of raising crop 1 is 3 unit/ha while for crop 2 it is 1 unit/ha. The benefit from crop 1 is 5 unit/ha and from crop 2, it is 2 unit/ha. The total of 300 units of money is available for raising both crops. What should be the cropping plan (how much area for crop 1 and how much area for crop 2) in order to maximize the total net benefits? Solve graphically to validate the result. (16)

(OR)

13.b)(i) What is simplex method used in linear programming optimization? (4)

(ii) Determine the optimum crop area of sugarcane (Sa) and banana (Ba) from the following Objective function

Maximize Z = 4 x Sa + 3 x Ba

Subjected to

3 x Ba + 2 x Sa <= 2400

Sa + Ba <= 1000

Sa >=200 and Ba >=0 (12)

14.a) During the analysis of allocation, there are three crop zones namely Vegetable, Pulses and Maize under the control of an irrigation engineer. The allocation is made in discrete steps of one unit ranging from 1 to 6. The benefit obtained by allotting each unit is tabulated below. Using dynamic programming determine the optimal allocation of water to each crop zones. (16)

Water Allotted	**Return from (Benefit)**		
Max 6	**Vegetable**	**Pulses**	**Maize**
1	5	5	7
2	8	6	12
3	9	3	16
4	8	-4	15
5	5	-15	12
6	0	-30	0

(OR)

14.b) A farm manager is considering crop planning for the forth coming irrigation season. He has computed the total resources available with his for all the seasons 5 crore rupees. He has a choice of 3 crops meant for export, to be raised in his farm. The quantum of resource required by each crop is given in the table below. Construct the dynamic programming model for the above situation.

Crops	Resources required crores	Export potential crores
Orchids	2	6.5
Roses	3	8.0
Geranium	1	3.0

Find optimum allocation of resources to each crop so as to obtain maximum profit. (16)

15.a)(i) Differentiate between conditional probability and exceedence probability. (5)

(ii) Determine the dependable flow in a stream for 50 % , 75 % and 90 % from the following observed flow data from the stream. (11)

....P.T.O.

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Flow m^3/s	15.3	45.6	88.6	12.3	95.7	77.8	50.3	82.3	37.8	57.8

(OR)

15.b) The following table denotes the monthly inflow and demand for a reservoir. The capacity of the reservoir is 60 M m^3. Assume evaporation and seepage losses as negligible. Determine the release pattern using the simulation method. (16)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Monthly Demand (M $m^{3)}$	2	9	16	35	12	9	10	14	27	36	16	5
Inflow (M $m^{3)}$	5	15	19	27	40	12	15	3	2	0	0	0

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