Name : ....

Roll No. : ....

Invigilator's Signature : ....

CS/B.Tech(CE)/SEM-8/CE-802/3/2012

2012

WATER RESOURCES MANAGEMENT & PLANNING

Time Allotted : 3 Hours   *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following :

$$10 \times 1 = 10$$

    i)   Belman's princple of optimality involves a solution of wate allocation procedure which is

        a)   forward process

        b)   backward process

        c)   any of these.

    ii)   In case of analysis of generation the stream flows, the data are generally distributed

        a)   normally   b)   log-normally

        c)   gamma   d)   any of these.

iii) In three parameter log normal distribution, an extra parameter is introduced which is called as

    a) location parameter   b) mean

    c) standard deviation   d) skewness.

iv) The objective function for water allocation of j users is actually obtained from the curve of

    a) net benefit *vs.* water allocation

    b) net benefit *vs.* users

    c) water allocation *vs.* users

    d) all of these.

v) In dynamic programming the cost function is given by $(a) c_j x_j{}^{dj}$ where d_j

    a) < 0 b) > 0

    c) < 1 d) > 1.

vi) The net benefit is given by after the end of time period t, where pv = present value of the assets

    a) $(1 + r)^t \, pv$ b) $(1 + r)^{-t} \, pv$

    c) $(1 + r)^t \, NB$ d) $(1 + r)^{-t} \, NB$.

vii) The non-negativity condition in case of water allocation system, is given by

    a) $x_j \geq Q$ b) $x_j \leq Q$

    c) $x_j \leq 0$ d) $x_j \geq 0$,

where $x_j \varnothing$ water allocated to j^{th} user.

viii) In the recursive equation

$$f_2(s_2) = \text{Max}^m . \left[R_2(x_2) + f_3(s_2 - x_2) \right],$$

where the value of $f_3(s_2 - x_2)$ depends on

    a) water allocation   b) state

    c) No. of users   d) all of these.

ix) NBP $_t$ in water resources system means

    a) net benefit of project p after time period t

    b) net benefit is p after time t

    c) net benefit of project p after end of 1 year

    d) net benefit is p after one year.

x) The equations are used to analysis a water allocation system, called (In Dynamic Programming)

    a) series of equation

    b) recursive equation

    c) state equation

    d) forward/backward equation.

GROUP – B
(Short Answer Type Questions)
Answer *all* the following. $3 \times 5 = 15$

2. Discuss dyamic programming for analysis the water allocation to the different users.

3. Write difference between two parameter Log normal models and three parameter log normal models.

4. Show that if compounding occurs at the end of m equal length periods within a year in which the nominal annual interest rate is r, then the effective annual interest rate r will yield the value equals to $(1 + r/m)^m - 1$.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

5. Consider two alternative water resource projects *A* & *B*. Project *A* will cost Rs. 2,533,000 and return Rs. 4,000,000 at the end of design life 10 years. Project *B* will cost Rs. 4,000,000 and return Rs. 2,000,000 at the end of design life 15 years. Assume interest rate of 0·1 per year.

   a) What is the present value of each project ?

   b) What is each project's annual net benefit ?

6. Calculate the optimum allocation to three users to get the maximum net benefit for the following problem for a discharge of 5 units.

   Values of user net benefit function-$R_j(x_j)$

x_j	$R_1(x_1)$	$R_2(x_2)$	$R_3(x_3)$
0	0	0	0
1	– 0·5	6·5	– 6·9
2	3	– 10·1	0
3	6·6	10·9	5·3
4	10	9·6	11·8
5	13·1	7·5	17·5

7. Write in detail the Langrange's multiplier's method for calculating the net benefit objective function for a particular project to allocate the water to different users.

8. Derive the equations for calculating the mean, standard deviation for generating the stream flows in two parameter log normal models.

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