Reg.No. \_\_\_\_\_\_\_\_\_\_\_\_



**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

**End Semester Examination – April/May – 2017**

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| **Code :** | **16CE3006** | **Duration :** | **3hrs** |
| **Sub. Name :** | **WATER RESOURCES PLANNING AND SYSTEMS ENGINEERING** | **Max. marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| Q. No. | Sub Div. | Questions | Course  Outcome | Marks |
| 1. | a. | What do you mean by slack and surplus variables and when it will be used? | CO2 | 4 |
|  | b. | Write short notes on  i. Basis and non basis variables.  ii. Stationary point and saddle point.  iii. Feasible and infeasible solution.  iv. Objecive function and constraints. | CO3 | 12 |
|  | c | Explain Sensitivity analysis in Linear Programming. | CO3 | 4 |
| (OR) | | | | |
| 2. | a. | Solve using simplex or dual simplex method: Minimize f(X) = x12+x22 – 4x1 – 4x2 + 8  Subject to -x1 – 2x2 + 4 ≥ 0  2x1 + x2 ≤ 5 | CO3 | 10 |
|  | b. | Two crops are grown on a land of 200 ha. The cost of raising crop A is 3 unit/ha, while for crop B it is 1 unit/ha. The benefit from crop A is 5 unit/ha and from crop 2 it is 2 unit/ha. A total of 300 units of money is available for raising both crops. Using Simplex method identify the cropping plan in order to maximize the net benefits | CO3 | 10 |
| 3 | a | Consider the system shown below where a reservoir is upstream of three demand sites along a river.    The net benefits derived from each use depend on the reliable amounts of water allocated to each use. Letting *x*it be the allocation to use *i* in period *t*, the net benefits for each period *t* equal  i. 6*x*1t– *x*1t2  ii. 7*x*2t – 1.5 *x*2t2  iii. 8*x*3t – 0.5 *x*3t2  Find the optimal operating policy for this reservoir that maximizes the total (four season) allocation benefits for the users. | CO3 | 12 |
|  | b. | Explain the various phases of water resources planning. | CO1 | 8 |
| (OR) | | | | |
| 4. | a. | An irrigation project is to be developed. There is 20 Mm3 of water available annually. Two high-value specialty crops, A and B, are considered for which water consumption requirements are 9000 m3 and 6000 m3, respectively. It has also been determined that the planting of more than 1600 hectares to crop A or 2400 hectares to crop B would cause an adverse effect on the market for these special crops. It has been estimated that each acre devoted to crop A will result in Rs. 28800 profit, while an acre of crop B will net Rs. 48,000. Structure the LP model for this problem stating the logics involved. | CO3 | 8 |
|  | b. | Explain the shadow pricing on project cost and give details about how it is calculated. | CO2 | 8 |
|  | c | Discuss in detail about the “Constitutional provisions for water resources development”. | CO2 | 4 |
| 5. | a. | List down the international funding agencies in water resources project development. | CO1 | 5 |
|  | b | List down different type of data required for drinking water supply project, irrigation project and hydropower project. | CO1 | 10 |
|  | c | What are the management tools for water resources planning? | CO1 | 5 |
| (OR) | | | | |
| 6. | a | Explain how DP can be applied in reservoir operation. | CO3 | 4 |
|  | b | Explain how Three-stage water allocation problem can be solved by formulation of backward recursion equation. | CO3 | 4 |
|  | c | Discuss Bellman’s principle of optimality. | CO3 | 4 |
|  | d | How the primal solution can be identified from a dual solution? Explain with an example. | CO3 | 8 |
| 7. | a | Define the following and give an example for each:  i. Primary benefits.  ii. Secondary benefits.  iii. Capital costs.  iv. Imperfect Costs.  v. Opportunity costs.  vi. Perfect market costs. | CO2 | 12 |
|  | b | List down the characteristics of DP problem. | CO3 | 4 |
|  | c | List down the water allocation priorities in water resources planning. | CO3 | 4 |
| (OR) | | | | |
| 8. | a | Explain different components of ‘National Water Policy’ | CO1 | 10 |
|  | b | Explain Mass curve method for determining,  i. Reservoir capacity for fulfilling the demand.  ii. Demand rate from a reservoir of given capacity. | CO2 | 10 |
| **Compulsory:** | | | | |
| 9. | a | What is a system and systems analysis? Explain various types of system. | CO1 | 10 |
|  | b | Explain the steps involved in a backward recursion method to determine the optimality in a water allocation problem. | CO1 | 5 |
|  | c | “For all LP problems, the optimum solution will always fall on the boundary of the feasible space”. Explain this with a graphical approach. | CO1 | 5 |

ALL THE BEST