

**M. TECH.-II (CIVIL-HYDRAULIC ENGINEERING) (CBCS  
- 2015 COURSE) : WINTER - 2017  
SUBJECT : OPTIMIZATION IN HYDRAULICS**

Day : Thursday  
Date : 30/11/2017

Time : 11.00 AM TO 02.00 PM  
Max. Marks : 60

**W-2017-2803**

**N.B.:**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in the **SEPARATE** answer books.

**SECTION – I**

**Q.1** Solve the following LPP by simplex method: **[10]**

Maximize  $z = 4x_1 + 3x_2 + 6x_3$   
 Subject to  $2x_1 + 3x_2 + 2x_3 \leq 440$   
 $4x_1 + 3x_3 \leq 470$   
 $2x_1 + 5x_2 \leq 430$   
 $x_1, x_2, x_3 \geq 0$

**OR**

Solve the following LPP by simplex method: **[10]**

Minimize  $z = 20x_1 + 25x_2$   
 Subject to  $12x_1 + 16x_2 \leq 100$   
 $16x_1 + 8x_2 \leq 80$

**Q.2** Solve the following Transportation problem by VAM method and obtain minimum cost: **[10]**

		Factory						Supply
		P	Q	R	S	T	U	
Godown	A	1	2	1	4	5	2	30
	B	3	3	2	1	4	3	50
	C	4	2	3	9	6	2	75
	D	3	1	7	3	4	6	20
	Demand	20	40	30	10	50	25	

**OR**

Solve the following Assignment problem to minimize the cost: **[10]**

		Job				
		A	B	C	D	E
Machine	1	5	11	10	12	4
	2	2	4	6	3	5
	3	3	12	5	14	6
	4	6	14	4	15	7
	5	7	9	8	12	5

**Q.3 a)** Explain golden section method. **[06]**

**b)** What are the applications of NLP in civil engineering? **[04]**

**P.T.O.**

**OR**

Use steepest ascent method to maximize [10]  
 $f = 2x_1 x_2 - 2x_1^2 + 6x_2^2$

**SECTION – II**

- Q.4 a)** State Bellman's principle of optimality and define the terms with reference to dynamic programming: [03]  
i) Stage      iii) Optimal decision rule  
ii) State      iv) Optimal policy
- b)** Optimize using Lagrangian multiplier technique: [07]  
 $Z = x^2 + y^2 + z^2$  such that  $4x + y^2 + 2z = 14$

**OR**

- a)** Discuss Kuhn – Tucker conditions to obtain solution of a non-linear programming problem (NLPP). [05]
- b)** Discuss application of dynamic programming technique for solving sequential decision problem of allocating available water to 'n' regions. [05]
- Q.5** Discuss application of GA and SA for optimization problems in water resources engineering. [10]

**OR**

- Discuss specific applications of Neural Network in study of hydrology and also fuzzy programming application to water resources problems. [10]
- Q.6** Discuss possible objectives and the constraints for a Khadakwasla reservoir operation problem having a canal system for 62000 ha command, compulsory water allocation for drinking and industry. Write the mathematical model for the system in general. [10]

**OR**

Write short note on "Integrated Water Resources Management Practices" with an example from published work in the area of water resources management. [10]

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