

**B.Tech. Civil (Construction Management) /  
B.Tech. Civil (Water Resources Engineering)**

**Term-End Examination**

**June, 2017**

00555

**ET-301(A)/ET-534(B) : SYSTEMS METHODS**

*Time : 3 hours*

*Maximum Marks : 70*

**Note :** All questions are **compulsory**. Use of calculator is allowed. Each and every notation should be elaborated. Assume any missing data suitably.

1. Answer any **six** of the following :  $6 \times 5 = 30$
- What do you understand by the word 'System'?
  - Define 'Social System'. What are the major features of a social system?
  - Consider a human being or even a plant. What would be the environment and the interactions for such a system?
  - The DC motor is the most suitable motor for variable speed drives. State the reasons.
  - Is man-made system, such as administrative system a physical system? Give reasons for your answer.
  - Explain Kirchhoff's law for the distribution of current in a network.

- (g) Which of the two has greater resistance : a 1 kW heater or a 100 W tungsten bulb, both marked for 230 V ? Explain with reasons.
- (h) Draw a feedback control system diagram as applied to the control of flow through pipes.

2. Answer any **two** of the following :

$2 \times 10 = 20$

- (a) Maximize :  $z = 4x_1 + 5x_2$   
 subject to :  $3x_1 + 2x_2 \leq 6$   
 $2x_1 + 4x_2 \leq 5$   
 $x_1, x_2 \geq 0$

Use appropriate linear programming method for solving the problem. Give assumptions.

- (b) Find the initial basic feasible solution for the following transportation problem by Vogel's approximation method. Also obtain the solution by least cost method and compare both the solutions.

		Destination				Supply
		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
Origin	O <sub>1</sub>	11	13	17	14	250
	O <sub>2</sub>	16	18	14	10	300
	O <sub>3</sub>	21	24	13	10	400
Demand		200	225	275	250	

(c) A booking counter takes 10 minutes to book a ticket for each customer. If the customers are arriving according to a Poisson process with a rate of 5 per hour, then find out

- (i) Expected queue length
- (ii) Expected waiting time of a customer in the queue
- (iii) Expected time a customer spends in the system.

3. Answer any *two* of the following :  $2 \times 10 = 20$

(a) A toy manufacturer uses 48,000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels, which it can produce at the rate of 800 pieces per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is ₹ 10 per wheel a year and set-up cost for a production run of wheels is 450. The firm operates 240 days per year. Determine each of the following :

- (i) Optimal run size
- (ii) Minimum total annual cost for carrying and set-up
- (iii) Cycle time for the optimal run size
- (iv) Run time

- (b) A construction project is broken down into the following 10 activities :

Activity	Immediate Predecessor	Time (Weeks)
1	—	4
2	1	2
3	1	4
4	1	3
5	2, 3	5
6	3	6
7	4	2
8	5	3
9	6, 7	5
10	8, 9	7

- (i) Draw the network diagram.
- (ii) Find the critical path.
- (iii) How many weeks will it take to complete the project ?
- (c) Write short notes on any **two** of the following :
- (i) Electromechanical Systems
- (ii) Environmental Systems
- (iii) Duality in Simplex Problem
- (iv) Sensitivity Analysis in Linear Programming

