

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

**Term-End Examination**

00803

**June, 2018**

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

*Time : 3 hours*

*Maximum Marks : 70*

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*Note : All questions are compulsory. Use of scientific calculator is permitted.*

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1. Answer any **six** of the following questions :  $6 \times 5 = 30$

(a) Explain the human-temperature regulation system with the help of a block diagram.

(b) What are causal and non-causal systems ?  
Cite at least two examples of each.

- (c) What do you understand by model of a system ? Describe Mathematical model and Physical model with the help of examples.
- (d) DC motor is the most suitable motor for variable speed drives. State with reasons.
- (e) Consider the domestic electric iron. Draw a block diagram for it. Identify the reference input, error, output signal, error detector and controller.
- (f) Explain the construction of the principle of operation of a microwave oven used for cooking.
- (g) Describe an engineering system with the help of suitable examples.
- (h) What will be the inputs and outputs for a civil engineering system ? Elaborate.
- (i) With the help of examples, differentiate between static system and dynamic system.

2. Answer any *two* of the following :

2×10=20

- (a) A firm makes two types of furniture, chairs and tables. The contribution for each product as calculated by the finance department is ₹ 200 per chair and ₹ 300 per table. Both products are processed on three production units  $U_1$ ,  $U_2$  and  $U_3$ . The time required in hours by each product and total time available in hours per week in each unit are as follows :

Production Units	Chair	Table	Available Time (Hours)
$U_1$	3	3	36
$U_2$	5	2	50
$U_3$	2	6	60

In order to maximize total contribution, how should the manufacturer schedule his/her production ?

(b) Four plants ( $P_1$ ,  $P_2$ ,  $P_3$  and  $P_4$ ) supply the items as per the requirements of three warehouses, ( $W_1$ ,  $W_2$  and  $W_3$ ). The availability at the plants, the requirements of the warehouses, and the associated unit transportation costs are shown in the matrix given below. Determine a basic feasible solution of the transportation problem using :

(i) North – West Corner Rule and

(ii) Vogel – Approximation Method

Plants	Warehouses			Availability
	$W_1$	$W_2$	$W_3$	
$P_1$	10	8	9	20
$P_2$	5	2	3	20
$P_3$	6	7	4	30
$P_4$	7	6	8	35
Requirement	25	26	49	

- (c) Five men are available to do five different jobs. From the past records, the time (in hours) taken by each man to do each job is given in the table.

		Job				
		I	II	III	IV	V
Man	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find the assignment of men to jobs so that total time taken in doing jobs gets minimized.

3. Answer any *two* of the following :

2×10=20

- (a) A car manufacturing company has decided to redesign its fuel pump for their new car model. This project involves several activities which take time and are listed in the table below :

Activity	Description of Activity	Predecessor Activity	Time Estimate (Weeks)
A	Evolve pump design	-	5
B	Develop market strategy	A	4
C	Design manufacturing process	A	7
D	Sales advertising media	B	8
E	Initial production run	C	9
F	Release fuel pump to market	D, E	4

Draw a network diagram for the above project. Identify the critical path. Find out the total project time. Compute total float, free float, and independent float for each activity.

- (b) A vending machine dispenses hot chocolate or coffee. Service time is 30 seconds per cup and is constant. Customers arrive at a mean rate of 80 per hour, and this rate is Poisson distributed.

Determine :

- (i) The average number of customers waiting in line.
- (ii) The average time customers spend in the system.

- (c) Answer any **four** of the following :  $4 \times 2 \frac{1}{2} = 10$

- (i) Write the objectives of Inventory Control.
- (ii) Differentiate between PERT and CPM.
- (iii) Define ordering cost, carrying cost and shortage cost.
- (iv) Discuss Multiple Solution and Infeasible Problem in linear programming.
- (v) What are the characteristics of dynamic programming problem ?