

**B.Tech. Civil (Construction Management) /  
B.Tech. Civil (Water Resources Engineering)  
Term-End Examination**

00013

December, 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) What do you understand by Economic System ? Describe its elements.
  - (b) What do you understand by Electric Power Generation Systems ? Describe Electric Power Generation Systems with the help of block diagram.
  - (c) The DC motor is the most suitable motor for variable speed drives. State the reasons.
  - (d) Differentiate between Physical and Non-Physical systems by citing at least two examples of each.

- (e) State two fundamental facts which make possible a study of systems.
- (f) Differentiate Scale model from Analogue model with the help of examples. Give at least two examples of each.
- (g) What is Dual Simplex Problem ? Discuss briefly.
- (h) What are the two basic types of Control systems ? Give at least two examples of each type.

2. Answer any *two* of the following : 2×10=20

- (a) A company owns two flour mills, X and Y which have different production capacities for high, medium and low grade flour. This company has entered a contract to supply flour to a firm every month with at least 18, 12 and 24 quintals of high, medium and low grade respectively. It costs the company ₹ 2000 and ₹ 1800 per day to run mill X and Y respectively. On a day, mill X produces 2, 4 and 8 quintals of high, medium and low grade flour respectively. How many days per month should each mill be operated in order to meet the contract order most economically ?

- (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.

Factory	Warehouse			Available
	E	F	G	
A	10	8	9	15
B	5	2	3	20
C	6	7	4	30
D	7	6	8	35
Requirement	25	26	49	100

- (c) A company has A and B as its products with profit margin ₹ 2 and ₹ 1 respectively per unit. The table below indicates the labour, equipment and material to produce each product per unit :

	Product A	Product B	Total
Labour (man hours)	3.0	2.0	12.0
Equipment (machine hours)	1.0	2.3	6.9
Material (unit)	1.0	1.4	4.9

Formulate the linear programming problem specifying the product mix which will maximise profit without exceeding the various levels of resources.

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

(a) 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, and
- (iii) expected time a customer spends in the system.

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

Activity	Description of Activity	Predecessor Activity	Time Estimate (Weeks)
A	Evolve the pump design	-	5
B	Develop marketing 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 the network diagram for the given project. Identify critical path. Find out the total float, free float and independent float for each activity.

(c) Write short notes on any *four* of the following :

- (i) Factors Affecting Inventory Management
- (ii) Kendall's Notation
- (iii) Fulkerson's Rule
- (iv) Infeasible Solution in Linear Programming
- (v) Sensitivity Analysis