

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

Term-End Examination **00081**
December, 2012

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.

1. Answer **any six** questions from the following : **6x5=30**
- (a) Define 'system'. Cite at least two characteristics of engineering system.
 - (b) What would be inputs and outputs of civil engineering systems such as a building, a bridge and a road ?
 - (c) What are different types of air and water pollutants coming out from construction industry ?
 - (d) Explain how thermostat of a refrigerator works ?
 - (e) Differentiate between static and dynamic systems with the help of suitable examples.
 - (f) What are various types of system models ? Give at least one example of each.

- (g) List down the major condition of degeneracy in transportation models.
- (h) Illustrate the concept of feedback control in automobile with the help of a simple sketch.
- (i) What could be regarded as the principles governing the interaction behaviour in the case of social systems ?
- (j) Draw/write various energy conversion systems to obtain electrical energy.

2. Answer **any two** of the following : **2x10=20**

- (a) A State Tourism Development Corporation's car rental service has a surplus of one car in each of the cities 1, 2, 3, 4, 5 and a deficit of one car in each of the cities 6, 7, 8, 9, 10. The distance between cities with a surplus and cities with a deficit car are given in the matrix below. How should the cars be despatched so as to minimize the total mileage travelled ?

		To				
		6	7	8	9	10
From	1	41	72	39	52	25
	2	22	29	49	65	81
	3	27	39	60	51	32
	4	45	50	48	52	37
	5	29	40	39	26	30

- (b) A company has 5 jobs to be done on 5 machines. Any job can be done on any machine. The cost of doing the jobs on different machines are given below. Assign the jobs for different machines so as to minimise the total cost.

		Machines				
		A	B	C	D	E
Jobs	1	13	8	16	18	19
	2	9	15	24	9	12
	3	12	9	4	4	4
	4	6	12	10	8	13
	5	15	17	18	12	20

- (c) 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 into a contract to supply flour to a firm every month with at least 18, 12 and 24 quintals of high, medium and low grade flour respectively. It costs the company Rs. 2000 and Rs. 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. Mill Y produces 4, 4 and 24 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 ?

3. Answer *any two* of the following : 2x10=20

- (a) Obtain the initial basic feasible solution of the following transportation problem using North West Corner Rule :

Origin \ Destination	Destination				Supply
	D ₁	D ₂	D ₃	D ₄	
O ₁	6	4	1	5	14
O ₂	8	9	2	7	16
O ₃	4	3	6	2	5
Requirement	6	10	15	4	

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

	Cost Details		
	Product		Total
	A	B	
Labour (Man hours)	3.0	2.0	12.0
Equipment (Machine hours)	1.0	2.3	6.9
Material	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.

- (c) Write short notes on the following
(*any four*) :
- (i) Factors affecting inventory
 - (ii) Kendalls's notations
 - (iii) Fulkerson's Rule
 - (iv) Duality in linear programming
 - (v) Sensitivity analysis
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