

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

**Term-End Examination**

**June, 2010**

00042

**ET-301(A)/ET-534(B) : SYSTEM 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* of the following : **6x5=30**
- (a) Describe the term 'system' with the help of suitable examples (at least three examples).
  - (b) What do you understand by 'Environmental system' ? Cite at least one cause each for air pollution, water pollution and ground pollution.
  - (c) Describe the human temperature regulation system with the help of a block diagram.
  - (d) Why is the DC series motor selected for electric traction ?
  - (e) What are the causal and non-causal systems ? Cite at least two examples of each.

- (f) Differentiate between block diagram and inter connection diagram with the help of suitable examples (at least one).
- (g) What do you understand by model of a system ? Describe in brief Mathematical Model and Physical Model with the help of examples.
- (h) Write the relevance of dynamic programming in decision making.

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

- (a) A farm is engaged in breeding pigs. The pigs are fed on various products grown on the farm. Because of the need to ensure nutrient constituents, it is necessary to buy additional one or two products, which we shall call A and B. The nutrient constituents (vitamins and proteins) in each units of the products are given below :

Nutrient Constituents	Nutrient in the Product		Minimum requirement of nutrient constituents
	A	B	
X	36	6	108
Y	3	12	36
Z	20	10	100

Product A costs Rs. 20 per unit and product B costs Rs. 40 per unit. Determine how much of products A and B must be purchased so as to provide the pigs nutrients not less than the minimum required, at the lowest possible cost. Solve graphically.

- (b) A company has three plants and four warehouses. The supply and demand in units and the corresponding transportation costs are given :

		WAREHOUSES				SUPPLY
		I	II	III	IV	
PLANTS	A	5	10	4	5	10
	B	6	8	7	2	25
	C	4	2	5	7	20
DEMAND		25	10	15	5	

Find the minimum transportation cost by VOGEL APPROXIMATION METHOD (VAM). Does this problem have more than one optimum solution ? If so, show any one of them.

- (c) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table :

		JOBS				
		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 that will minimize the total time taken.

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

(a) A large service station has a store room from where the service mechanics take the parts for the jobs they work upon. The mechanics wait in the line to get the parts that they need. The store is manned by one attendant who can on average, attend 7 mechanics per hour. It is observed that on an average the mechanic's average arrival rate at the store room is 5 per hour. Assuming that the pattern of mechanic's arrival is poisson distributed and the servicing time is exponentially distributed, determine :

- (i) the expected number of mechanics in the system, that is those waiting in line and being serviced by the attendant,
- (ii) the expected number of mechanics waiting in the queue,
- (iii) the expected time that a mechanic has to spend in the queue,
- (iv) the expected time that a mechanic spends in the system i.e., waiting in the queue and getting service.

(b) Draw network diagram from the following activities and find critical path and total slack of activities :

Job	A	B	C	D	E	F	G	H	I	J	K
Job (day) time	13	8	10	9	11	10	8	6	7	14	18
Immediate Predecessor	-	A	B	C	B	E	D, F	E	H	G, I	J

- (c) Answer *any four* of the following :
- (i) What are the main objectives of Inventory control ?
  - (ii) Define carrying cost and shortage cost.
  - (iii) Discuss the difference between PERT and CPM.
  - (iv) What do you understand by Multiple solution of a linear programming problem ?
  - (v) Write Kendall's Notations and symbols for a general queuing system.
-