01534

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

Term-End Examination

June, 2011

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

Time : 3 hours   *Maximum Marks : 70*

Note :   *All questions are **compulsory**. Use of scientific non-programmable calculator is allowed. Each and every notation should be elaborated.*

1. Answer **any six** questions :   6x5=30

   (a) Are man made systems, such as administrative, economic systems, etc. physical systems ? Give reasons for your answer.

   (b) What are the peculiar characteristics of process control systems ?

   (c) Explain the construction and principle of operation of a microwave oven used for cooking.

   (d) An electric lamp has power of 12 Watt, when a potential difference of 100 Volt is applied. What is its resistance ?

   (e) What is the role of precision control system in process industry ?

(f) Define inductance and capacitance. Write their S.I.units. Write power and energy relationship for an inductance and for a capacitance.

(g) Consider the domestic temperature controlled electric iron. Draw a block diagram for it. Identify the reference input, error, output signal, error detector and controller.

(h) Elevators are used to carry passengers and goods up and down in a multi-storeyed building. Which type of motor is used for this purpose ? What motion transformer is used to convert rotation of motor shaft into up and down motion of the elevator ?

(i) Explain Kirchoff's law for any electrical network.

(j) Draw/write various energy conversion systems to obtain electrical energy.

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

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

Machines

Jobs	A	B	C	D	E
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

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

Demand \ Origin	D_1	D_2	D_3	D_4	Supply
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	

(c) Maximise $z = 4x_1 + 5x_2$
Subject to : $3x_1 + 2x_2 \le 6$
$2x_1 + 4x_2 \le 5$
$x_1, x_2 \ge 0$
Use linear programming simplex method for solving the problem.

3. Answer *any two* of the following : 2x10=20
   (a) A T.V. repairman finds that the time spent on his jobs is an exponential distribution with mean 30 minutes. He repairs sets in the order in which they come in. If the arrival of sets is approximately Poisson with an average rate of 10 per 8 hour day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

(b) A small project is composed of seven activities whose time estimates are listed in the table below :

Estimated duration (weeks)

Activity	Optimistic	Most likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

You are required to :

(i) Draw the project network

(ii) Find the expected duration and variance of each activity

(iii) Calculate the early and late occurrence for each event and the expected project length.

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

(i) Transient state and steady state

(ii) Functions of Inventory Control

(iii) Important characteristics of waiting line models

(iv) Deterministic Single Item Inventory model

(v) First and second order systems