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ET-301(A)/ET-534(B)

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

Term-End Examination

December, 2016

00553

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*** of the following : *6×5=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 watts, when a potential difference of 100 volts is applied. What is its resistance ?

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

(f) Define inductance and capacitance. Write their S.I. units. Write the 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 the motor shaft into up and down motion of the elevator ?

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

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

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

(a) A diet for a sick person must contain at least 4000 units of vitamins, 50 units of minerals and 1400 units of calories. Two foods, A and B, are available at a cost of ₹ 4 and ₹ 3 per unit respectively. If one unit of A contains 200 units of vitamins, 1 unit of minerals and 40 units of calories and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 units of calories. Find by graphical method, what combination of foods be used to have least cost.

(b) A company has 3 factories, A, B and C, which supply 4 warehouses situated at P, Q, R and S. The monthly production capacity of A, B and C are 120, 80 and 200 tons respectively. The monthly requirements (tons) for the warehouses P, Q, R and S are 60, 50, 140 and 50 respectively. The transportation cost (₹ per ton) matrix is given below :

	Warehouses			
Factories	P	Q	R	S
A	4	5	2	5
B	3	8	4	8
C	7	4	7	4

Using Vogel's method, determine the optimum transportation distribution of products to the warehouses to minimize total transportation cost.

(c) An automobile dealer wishes to put three repairmen to four different jobs. The repairmen have somewhat different kinds of skills and they exhibit different levels of efficiency from one job to another. The dealer has estimated the number of man-hours that would be required for each job-man

combination. This is given in matrix form in the following table :

Man \ Job	A	B	C	D
1	5	3	2	8
2	7	9	2	6
3	6	4	5	7

Find the optimal assignment that will result in minimum man-hours needed.

3. Answer any ***two*** of the following : *2×10=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 managed by one attendant who can on an 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, and

(iv) the expected time that a mechanic spends in the system, i.e., waiting in the queue and getting service.

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

Job	*Job (day) time*	*Immediate Predecessor*
A	13	–
B	8	A
C	10	B
D	9	C
E	11	B
F	10	E
G	8	D, F
H	6	E
I	7	H
J	14	G, I
K	18	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 to a linear programming problem ?

(v) Write Kendall's notations and symbols for a general queuing problem/system.
