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

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

Term-End Examination

December, 2015

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

Time : 3 hours   *Maximum Marks : 70*

Note : *All questions are **compulsory**. Use of scientific calculator is permitted.*

1.   Answer any *six* of the following questions :   *6×5=30*

(a)   Define 'Social System'. What are the characteristic features of a social system ?

(b)   In what respects are process models different from models for mechanical, electrical and hydraulic systems ?

(c)   Describe the human temperature regulation system with the help of a block diagram.

(d)   Draw/Write various energy conversion systems to obtain electrical energy.

(e)   Illustrate the concept of feedback control in automobile with the help of a simple sketch.

(f)   Differentiate between static and dynamic systems with the help of suitable examples.

(g) What would be the inputs and outputs of civil engineering systems such as a building, a bridge and a road project ?

(h) What do you understand by 'Environmental system' ? Give at least one cause for air pollution, water pollution and ground pollution.

2. Answer any *two* of the following :

(a) An automobile dealer wishes to put four 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 the matrix form in the following table :   *10*

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

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

(b) A manufacturer has distribution centres located at Agra, Allahabad and Kolkata. These centres have 8, 4 and 8 units available of his product. His retail outlets require the following number of units : *10*

A, 5; B, 2; C, 4; D, 6 and E, 3.

The shipping cost per unit (in ₹) between each centre and outlet is given in the following table. Determine the optimal shipping cost by using Vogel's Approximation Method (VAM).

Distribution Centre	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

(c) Solve the following Linear programming problem by using graphical method : *10*

Maximize $z = 9x + 10y$

subject to $11x + 9y \leq 9900$

$7x + 12y \leq 8400$

$6x + 16y \leq 9600$

$x \geq 0, y \geq 0.$

3. Answer any *two* of the following questions :

(a) A firm has a single machinist in a repair shop. He works eight hours a day and on an average four machines break each day. It takes on the average one hour to repair a machine.

Using Poisson-exponential model determine

(i)   the expected number of machines in the repair shop,

(ii)   the expected number of machines in the shop on which the machinist has not started to work,

(iii) the average down time (waiting for repairs or undergoing repairs) per machine.

(iv)   the average time a machine waits for service.

(v)   the expected proportion of time a facility will be idle.   *10*

(b) A company manufacturing plant and equipment for chemical processing is in the process of quoting a tender called by a Public Sector Undertaking. Delivery date once promised is crucial and penalty clause is applicable. Project Manager has listed down the activities in the project as under :   *10*

S.No.	Activity	Immediate Preceding Activity	Activity time (in weeks)		
			Optimistic Time	Most likely Time	Pessimistic Time
1	A	–	1	3	5
2	B	–	2	4	6
3	C	A	3	5	7
4	D	A	5	6	7
5	E	C	5	7	9
6	F	D	6	8	10
7	G	B	7	9	11
8	H	E, F, G	2	3	4

Using PERT :

(i) Find out the delivery week from the date of commencement of the project,

(ii) Find out the total float and free float for each of the activities.

(c) Write short notes on any *two* of the following : 5+5=*10*

(i) Unbounded solution and degeneracy in linear programming problem

(ii) Economic Order Quantity (EOQ)

(iii) Sensitivity Analysis

(iv) Kendall's Notations

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