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

Term-End Examination

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December, 2014

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

Time : 3 hours   *Maximum Marks : 70*

*Note : All questions are **compulsory**. Use of calculators is allowed. Each and every notation should be elaborated. Assume any missing data suitably.*

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

    (a) What do you understand by Economic System ? Describe its elements.

    (b) What do you understand by Electric Power Generation systems ? Describe an Electric Power Generation system with the help of a block diagram.

    (c) DC motor is the most suitable motor for variable speed drives. State the reasons.

    (d) Differentiate between physical and non-physical systems by citing at least two examples of each.

(e) State two fundamental facts which make possible a study of systems.

(f) Describe scale model and analogue model with the help of examples (at least two examples of each).

(g) What is a dual simplex problem ? Explain with the help of suitable example.

(h) What are two basic types of control systems ? Give at least two examples of each type.

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

(a) A company has 5 jobs to be done on five 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 minimize the total cost :

Jobs	Machines				
	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 :

Origin \ Demand	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) Maximize $z = 4x_1 + 5x_2$

subject to : $3x_1 + 2x_2 \leq 6$

$2x_1 + 4x_2 \leq 5$

$x_1, x_2 \geq 0$

Use Simplex method for solving the problem.

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

(a) A booking counter takes 10 minutes to book a ticket for each customer. If the customers are assisting according to a Poisson process with a rate of 5 per hour, then find out :

(i) Expected queue length

(ii) Expected waiting time of a customer in the queue

(iii) Expected time a customer spends in the system

(b) A car manufacturing company has decided to redesign its fuel pump for their new car model. This project involves several activities which are listed in the table below :

Activity	Description of Activity	Predecessor Activity	Time Estimate (weeks)
A	Evolve the pump design	–	5
B	Develop marketing strategy	A	4
C	Design manufacturing process	A	7
D	Sales advertising media	B	8
E	Initial production run	C	9
F	Release fuel pump to market	D,E	4

Draw network diagram for the given project. Identify critical path. Find out the total project time. Compute total float, free float and independent float for each activity.

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

(i) Factors affecting inventory management

(ii) Kendall's Notations

(iii) Fulkerson's Rule

(iv) Duality in Linear Programming

(v) Sensitivity Analysis