No. of Printed Pages : 3

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

01065

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

## Term-End Examination

## June, 2012

## ET-301(A)/ET-534(B) : SYSTEMS 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*** questions from the following : **6x5=30**

(a) Define 'system' with specific reference to 'engineering system'.

(b) Differentiate between static and dynamic system with the help of suitable examples.

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

(d) Draw a feedback control system diagram as applied to the control of flow through pipes.

(e) Explain that in what respect are process models different from models for mechanical, electrical and hydraulic systems ?

(f) Explain Kirchoff's laws for any electrical network.

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

(h) What are elements of translational systems ? Define each element.

(i) Consider the domestic temperature controlled electric iron. It is an example of a temperature control system. Draw a block diagram for it and identify the reference input, error and output signals, controller and plant.

(j) How does a closed loop (feed back) control system work ? Illustrate giving examples.

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

(a) 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 linear programming Simplex Method for solving the problem.

(b) Find the initial basic feasible solution for the following transportation problem by Vogel's Approximation method. Also obtain the solution by Least Cost Method and compare both the solutions.

Destination

| Origin | | $D_1$ | $D_2$ | $D_3$ | $D_4$ | Supply |
|---|---|---|---|---|---|---|
| | $O_1$ | 11 | 13 | 17 | 14 | 250 |
| | $O_2$ | 16 | 18 | 14 | 10 | 300 |
| | $O_3$ | 21 | 24 | 13 | 10 | 400 |
| | Demand | 200 | 225 | 275 | 250 | |

(c) A booking counter takes 10 minutes to book a ticket for each customer. If the customers are arriving 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

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

(a) A manufacturer requires 15000 units of a part annually for an assembly operation. The manufacturer can produce this part at the rate of 100 units per day and the setup cost for each production run is Rs.24. To hold one unit of this part in inventory costs the manufacturer Rs. 5 per year. Assuming 250 working days per year, what will be the optimum manufacturing quantity ?

(b) A T.V. repairman finds that the time spent on his job is an exponential distribution with a mean of 30 minutes. He repairs sets in the order which they come. If the arrival of sets is approximately poisson with an average rate of 10 per 8 hours day, what is the repairman's expected idle time each day ? How many jobs are ahead of the average set just brought in ?

(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

---