B.Tech. Civil (Construction Management) / B.Tech. Civil (Water Resources Engineering)
Term-End Examination
December, 2013

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 :   6x5=30

   (a)   What do you understand by the closed loop control system ? How will you distinguish between open loop and closed loop control system ? Give examples for both systems.

   (b)   Describe one example of hydraulic, mechanical, thermal, and electro mechanical control system. Also draw block diagram of each system.

   (c)   Differentiate between static and dynamic system.

   (d)   Describe the three basic elements of electric systems.

   (e)   Explain anti-aircraft Radar Tracking control system with the help of suitable diagram.

   (f)   Describe Refrigeration system with the help of block diagram.

   (g)   Give one example each for Pneumatic chemical and biological system.

   (h)   Discuss different types of electric power generation system with the help of block diagram.

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

(a) Solve the following linear programming problem by graphically;

Maximize : $z = 3x_1 + 2x_2$

Subject to $-2x_1 + x_2 \le 1$

$$x_1 \le 2$$

$$x_1 + x_2 \le 3$$

and $x_1, x_2 \ge 0$

(b) Use the following transportation table to do the following :

(i) Find the optimal solution,

(ii) What is the total cost ?

To From	1	2	3	Supply
1	3	6	2	40
2	3	1	3	50
3	7	6	4	65
Demand	55	55	45	

(c) There are five depots having one car each. For five customers, these cars are to be deputed. The distance from depots to the customer's place is as follows. Make assignment to minimise total distance covered.

Depot

to From	A	B	C	D	E
1	135	160	140	55	50
2	120	130	110	35	50
3	130	175	125	80	80
4	160	190	170	80	80
5	175	200	185	105	110

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

(a) A construction project is broken down into the following 10 activities.

Activity	Immediate Predecessor	Time (Weeks)
1	-	4
2	1	2
3	1	4
4	1	3
5	2, 3	5
6	3	6
7	4	2
8	5	3
9	6, 7	5
10	8, 9	7

(i) Draw the network diagram
(ii) Find the critical path
(iii) How many weeks will it take to complete the project ?

(b) A toy manufacturer uses 48,000 rubber wheels per year for its popular dump truck series. The firm makes its own wheels, which it can produce at a rate of 800 per day. The toy trucks are assembled uniformly over the entire year. Carrying cost is Rs 10 per wheel a year set up cost for a production run of wheels is Rs 450. The firm operates 240 days per year. Determine each of the following :
(i) Optimal run size
(ii) Minimum total annual cost for carrying and set-up
(iii) Cycle time for the optimal run size
(iv) Run time

(c) A vending machine dispenses hot chocolate or coffee. Service time is 30 seconds per cup and is constant. Customers arrive at a mean rate of 80 per hour, and this rate is Poisson distributed.

Determine :

(i) The average number of customers waiting in line

(ii) The average time customers spend in the system

(iii) The average number in the system

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