

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

**Term-End Examination 01872  
December, 2011**

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

*Time : 3 hours*

*Maximum Marks : 70*

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**Note :** *All questions are compulsory. Use of scientific non-programmable calculator is allowed. Each and every notation should be elaborated.*

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1. Answer **any six** questions : **6x5=30**
- (a) Which of the two has greater resistance ; a 1kW heater or a 100W tungsten bulb, both marked for 230 V ?
  - (b) What are the peculiar characteristics of process control systems.
  - (c) Why is the DC series motor selected for electric fraction ?
  - (d) Define 'social system'. What are the characteristic features of a social system ?
  - (e) What is a Computer Numeric Control (CNC) system ?
  - (f) In what respects are process models different from model for mechanical, electric and hydraulic systems ?

- (g) What are the different types of air and water pollutants coming out from construction industry ?
- (h) What could be regarded as the principles governing the interaction of social systems ?
- (i) Explain causal and non-causal systems with the help of suitable examples.
- (j) What is electrical analogue model ? Why do we think of electrical analogue of physical system ?

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

- (a) A company owns two flour mills, X and Y which have different production capacities for high, medium and low grade flour. This company has entered a contract to supply flour to a firm every month with at least 18, 12 and 24 quintals of high, medium and low grade respectively. It costs the company Rs. 2000 and Rs. 1800 per day to run mill X and Y respectively. On a day, mill X produces 2, 4 and 8 quintals of high, medium and low grade flour respectively. How many days per month should each mill be operated in order to meet the contract order most economically ?
- (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				
		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Supply
Origin	O <sub>1</sub>	11	13	17	14	250
	O <sub>2</sub>	16	18	14	10	300
	O <sub>3</sub>	21	24	13	10	400
Demand		200	225	275	250	

- (c) A company has A and B as its products with profit margin Rs. 2 and Re. 1 respectively per unit. The table below indicates the labour, equipment and material to produce each product per unit.

	Product A	Product B	Total
Labour (Man hours)	3.0	2.0	12.0
Equipment (machine hours)	1.0	2.3	6.9
Material (Unit)	1.0	1.4	4.9

Formulate the linear programming problem specifying the product mix which will maximise profit without exceeding the various levels of resources.

3. Answer *any two* of the following :

2x10=20

- (a) 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 table below. First, activity is that the engineering department must evolve the design of fuel pump. Second, the marketing department must develop the marketing strategy for its promotion. Third, a new manufacturing process must be designed. Fourth, advertising media must be selected. Fifth, an initial product run must be completed. Finally, the pump must be released to the market.

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 the critical path. Find out the total project time. Compute total float free float and independent float for each activity.

- (b) A booking counter takes 10 minutes to book a ticket for each customer. If the customers are assigned according to a Poirson 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
- (c) Write short notes on the following :  
(*any four*)
- (i) Factors affecting inventory
  - (ii) Kendall's notations
  - (iii) Fulkerson Rule
  - (iv) Duality in linear programming
  - (v) Sensitivity analysis
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