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

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

00715

Term-End Examination

June, 2014

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. Assume any missing data suitably.*

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

(a) Describe the term 'system' with the help of suitable examples (at least three examples).

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

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

(d) Why is d.c. series motor selected for electric traction ?

(e) What are the causal and non-causal systems ? Cite at least two examples of each.

(f) Differentiate between block diagram and inter-connection diagram with the help of suitable examples (at least one).

(g) What do you understand by model of a system ? Describe the brief Mathematical Model and Physical Model with the help of examples.

(h) Write the relevance of dynamic programming in decision making.

2. Answer any ***two*** of the following : *2×10=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 into 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 ₹ 2,000 and ₹ 1,800 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. Mill y produces 2, 2 and 12 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 economically ?

(b) A project comprises of eight activities. The precedence relationship and estimated duration of the eight activities are given as :

Activity	Immediate Predecessor	Expected time to complete
A	–	3
B	–	2
C	–	5
D	A	5
E	A	4
F	A	7
G	B, D	10
H	C, F	10

(i) Draw the project network and label the same.

(ii) Estimate the project duration.

(iii) Identify the critical activities and critical path.

(iv) Re-estimate the project duration if the activity A gets delayed by 10 days.

(c) Four factories (A, B, C, D) supply the requirements of three warehouses (E, F, G). The availability at the factories, the requirement of the warehouses and the various associated unit transportation costs are presented in the matrix below. Find an initial basic feasible solution of the transportation problem using :

(i) North-West corner rule, and

(ii) Vogel approximation method

	Warehouses			
Factory	E	F	G	Available
A	10	8	9	15
B	5	2	3	20
C	6	7	4	30
D	7	6	8	35
Required	25	26	49	100

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

(a) A company decides to make four sub-assemblies through four contractors. Each contractor is to receive only one sub-assembly. The cost of each sub-assembly is determined by the bids submitted by each contractor and is shown in the following table in hundreds of rupees. Assign the different sub-assemblies to contractors to minimise the total cost.

Sub-assemblies \ Contractors	1	2	3	4
1	15	13	14	17
2	11	12	15	13
3	13	12	10	11
4	14	17	14	16

(b) A construction company requires a large amount of gravel and sand. The requirements are 1000 m^3 of coarse gravel, 2000 m^3 of fine gravel and 1000 m^3 of fine sand. There are two pits A and B from which the above materials can be obtained. Analysis shows that material at each pit has the following composition :

Material	Pit A	Pit B
Coarse gravel	15%	35%
Fine gravel	20%	40%
Fine sand	30%	15%
Coarse sand	35%	10%

It costs the construction company ₹ 10/m^3 for material and handling from Pit A and ₹ 15/m^3 from Pit B. Formulate the linear programming model.

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

(i) Electro-mechanical systems

(ii) Environmental systems

(iii) Duality in simplex problem

(iv) Sensitivity analysis
