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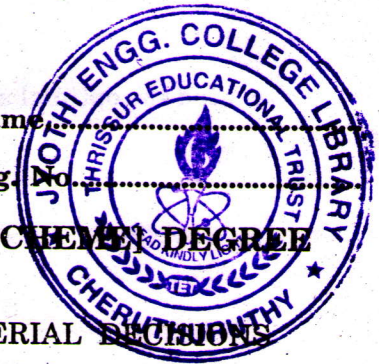
FIFTH SEMESTER B.TECH. (ENGINEERING) [14 SCHEME] DEGREE EXAMINATION, NOVEMBER 2016

EC 14 506—QUANTITATIVE TECHNIQUES AND MANAGERIAL DECISIONS

Time : Three Hours　　　　　　　　　　　　　　　　　　　Maximum : 100 Marks

Part A

*Answer any **eight** questions.*

I. (a) Explain and differentiate decision making under risk and decision making under uncertainty.

　(b) Write short note on Bayesian decision theory.

　(c) Construct the network for the following set of activities :

Activity :	A	B	C	D	E	F	G	H	I	J
Immediate predecessor :	–	–	B	A, B	A, B	B	E, D, F	D, E	E, F	H, G, I, C

　(d) How will you control the inventories of a manufacturing organisation ? Discuss the various inventory costs associated with this organisation.

　(e) Write short notes on the following :

　　　(i) Necessity for inventory control.

　　　(ii) Functions performed by inventory.

　(f) Explain the significance of the following variables with examples :

　　　(i) Slack variable ; (ii) Surplus variables ; (iii) Artificial variables

　(g) Explain the concept of degeneracy in simplex method.

　(h) Determine an initial basic feasible solution to the following transportation problem :

		Destination			
	D_1	D_2	D_3	D_4	Availability
O_1	1	2	1	4	20
O_2	3	3	2	1	40
Origin　O_3	4	2	5	9	20
O_4	5	3	6	10	20
Requirement	20	40	30	10	

Turn over

(i) Find the optimal assignment for the assignment problem with the following cost matrix :

	I	II	III	IV
A	5	3	1	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	6

(j) State the common and distinguishing features of the assignment and the transportation models.

(8 × 5 = 40 marks)

Part B

Answer all questions.

II. (A) Consider a project comprising of 12 activities with the following precedence relationships and durations :

Activity   : A B C D E F G H I J K L

Immediate predecessor : – – A A A D C D E, F B, I G, H J, K

Duration (weeks) : 4 8 2 4 9 1 7 3 2 2 5 4

   (i) Draw the network and find the critical path.

   (ii) List the total float, free float and Independent float for all the activities.

Or

(B) Following table lists the data for a PERT network :

Activity

$(i-j)$: 1–2 1–3 1–4 2–3 2–5 3–4 3–6 4–6 5–6

t_o : 2   6   6   2   11   15   3   9   4

t_m : 4   6   12   5   14   24   6   15   10

t_p : 6   6   24   8   28   45   9   27   16

   (i) Draw the network, estimate the earliest and latest event times for all nodes and hence derive critical path.

   (ii) Estimate the expected duration of the project and the corresponding variance.

   (iii) What is the probability that the project duration will exceed 60 days ?

III. (A) An item is manufactured to meet known demand for four periods according to the following data :

Production range (units)	Unit production cost ($) for period			
	1	2	3	4
1 – 3	1	2	3	4
4 – 11	1	2	2	3
12 – 15	2	4	7	5
16 – 25	5	6	10	7
Unit holding cost to next period ($)	.30	.35	.20	.25
Total demand (units)	11	4	17	29

   (i) Find the optimal solution, indicating the number of units to be produced in each period.

  (ii) Suppose that 10 additional units are needed in period 4. Where should they be produced.

Or

(B) Electro uses resin in its manufacturing process at the rate of 1,000 gallons per month. It costs Electro $ 100 to place an order for a new shipment. The holding cost per gallon per month in $ 2, and the shortage cost per gallon is $ 10. Historical data show that the demand during lead time is uniform over the range (0, 100) gallons. Determine the optimal ordering policy for Electro.

IV. (A) Solve the following L.P.P. by artificial variable method :

Maximize $z = x_1 + 5x_2 + 3x_3$

subject to $x_1 + 2x_2 + x_3 = 3$
$$2x_1 - x_2 = 4$$
$$x_1, x_2, x_3 \geq 0.$$

Or

(B) Solve the following L.P.P. by two phase method :

Maximize $z = 3x_1 + 2x_2 + 3x_3$

subject to $\quad 2x_1 + x_2 + x_3 \leq 2$
$$3x_1 + 4x_2 + 2x_3 \geq 8$$
$$x_1, x_2, x_3 \geq 0.$$

Turn over

V. (A) A product is produced by four factories F_1, F_2, F_3, F_4. Their unit production costs are Rs. 2, 3, 1 and 5 respectively. Production capacity of the factories are 50, 70, 30 and 50 units respectively. The product is supplied to four stores S_1, S_2, S_3 and S_4, the requirements of which are 25, 35, 105 and 20 respectively. Unit cost of transportation are given in the following table. Find the transportation plan such that, the total production and transportation cost is minimum :

	S_1	S_2	S_3	S_4
F_1	2	4	6	11
F_2	10	8	7	5
F_3	13	3	9	12
F_4	4	6	8	3

Or

(B) Solve the assignment problem represented by matrix :

	1	2	3	4	5	6
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

(4 × 15 = 60 marks)