11 APR 2019

M.SC. STATISTICS [SEMESTER IV] EXAMINATIONS
PAPER –14
Advance Operation Research

Hour :2 CODE - 3579 **Mark :70**

Q 1 (A) Explain the Hungarian method of solving an Assignment problem. (6)

(B) Use simplex method to solve the following problem. (8)

Maximize $Z = 7x_1 + 9x_2$

subject to $2x_1 + 7x_2 \leq 28$
$3x_1 + 2x_3 \leq 460$
$3x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0$

OR

Q 1 (A) Consider the following LPP model, Find optimal solution for given model. (8)

$$Z_{max} = 3x_1 + 9x_2$$

Sub. to,

$$x_1 + 4x_2 \leq 8$$
$$x_1 + 2x_2 \leq 4$$
$$x_1, x_2 \geq 0$$

(B) Discuss the rules for constructing the dual problem and find solution by using rules for given problems: (6)

(i) $Z_{max} = 2x_1 + 3x_2 + x_3$
Subject to
$4x_1 + 3x_2 + x_3 \leq 6$
$x_1 + 2x_2 + 5x_3 \leq 4$
$x_1 \geq 0, x_2 \geq 0, x_3 \geq 0$

(ii) $Z_{min} = 4x_1 + x_2$
Subject to,
$4x_1 + 3x_2 \geq 6$
$x_1 + 2x_2 \leq 4$
$x_1, x_2 \geq 0$

Q 2 (A) Use Big M- method to solve the following problem. (7)

Maximize $Z = 6X_1 + 4X_2$

Subject to : $2X_1 + 3X_2 \leq 30,$

$3X_1 + 2X_2 \leq 24,$
$X_1 + X_2 \leq 3$

$X_1 \leq 0, X_2 \leq 0.$

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(B) Describe Inventory Cost Components. (7)

OR

Q 2 (A) Solve the following linear programming problem using two phase method (7)

Z_{max}: $5x_1-4x_2+3x_3$

Subject to:

$2x_1+x_2-6x_3=20$
$6x_1+5x_2+10x_3\geq 76$
$8x_1-3x_2+6x_3\geq 50$
$X_1,x_2,x_3\geq 0$

(B) State and prove the fundamental theorem of duality in linear program. (7)

Q 3 (A) What is an Integer Programming? Explain the 'Branch and Bound' method for solving Integer Programming Problem. (7)

(B) Derive an expression for steady state probability, { P_n, $n\geq 0$} for M/M/1(∞: FIFO) system. Also obtain expression for various measures of effectiveness for the system. (7)

OR

Q 3 (A) Solve the following inventory model with given information (7)

Period (i)	Demand (Di)	Setup Cost (Ki)
1	76	98
2	26	114
3	90	185
4	67	70

The initial inventory x1 is 15 units, the unit production cost is Rs. 2, and the unit holding cost per period is Rs. 1 for all the periods. Find an optimal transportation schedule. Compute optimal Cost.

(B) Apply MODI method for Given transportation problem, (7)

WAREHOUSE	FACTORIES				
	A	B	C	D	REQUIRMENTS
1	19	30	50	10	7
2	70	30	40	60	9
3	40	8	70	20	18
AVAILABILITY	5	8	7	14	

Q 4 (A) Solve the following game by using the principle of dominance and find the game (7)

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value.

		Player B			
		I	II	III	IV
Player A	I	3	2	4	0
	II	3	4	2	4
	III	4	2	4	0
	IV	0	4	0	8

(B) There are seven jobs, each of which has to go through the machines M1, M2 and M3 in the order. Processing times in hours are given as below: (7)

Job	1	2	3	4	5	6	7
Machine M1	7	8	6	6	7	8	5
Machine M2	2	2	1	3	3	2	4
Machine M3	6	5	4	4	2	1	5

Find Total elapsed time and Idle times of Machines.

OR

Q4(A) Write Difference Between PERT-CPM. (7)

(B) For the M|M|1 with infinite number in the system, show that,

I) The expected number in the queue given that the queue is not empty $= \frac{1}{1-\rho}$ (7)

II) The expected waiting time in the queue for those who must wait $= \frac{1}{\mu-\lambda}$

Q 5(A) State and prove Kuhn-Tuckers necessary and sufficient conditions in Non-Linear Programming Problem. (7)

(B) Describe Single Item Inventory Control Models without Shortages with (i) Constant rate of demand and (ii) Different Rate Of Demand. (7)

OR

Q 5 Project consists of following activities duration of each activity is given in the following table: (14)

Activity	Preceding Activity	Time estimayes(Weeks)		
		Optimistic	Most likely	Pessimistic
A	-	04	07	16
B	-	01	05	15
C	A	06	12	30
D	A	02	05	08
E	C	05	11	17
F	D	03	06	15
G	B	03	09	27
H	E,F	01	04	07
I	G	04	19	28

(i) Draw the PERT network diagram.

(ii)Identify the critical path and determine the mean projection time.

(iii)Find the probability that the project is completed in 36 weeks.

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