Roll No.: .....

Total No. of Questions : 11] [Total No. of Printed Pages : 12

PK-476

M.Sc. IV Semester Mathematics (Reg./Pvt./ ATKT) Examination June 2018

OPERATIONS RESEARCH - II

Optional Paper Select any four

Paper - VIII

Time Allowed : Three Hours] *[Maximum Marks : { Reg. - 85 Pvt. - 100*

Note : Attempt all questions.

Section - A

Objective Type Questions

Q.1. Choose the correct answer : 15×1=15

i) Transportation model helps us in :

(a) Finding nearest transport office

(b) Finding transportation cost between two cities

(c) Finding lowest transportation cost

(d) None of these

ii) A transportation problem is balanced if

(a) Total demand = total supply

(b) Total demand < total supply

(c) Total demand > total supply

(d) None of these

iii) For optimality test:

(a) BFS must contain m + n allocations

(b) BFS must contain m + n + 1 allocations

(c) BFS must contain m + n – 1 allocations

(d) None of these

iv) Assignment problem is basically a :

(a) Maximization problem

(b) Primal problem

(c) Minimization problem

(d) Transportation problem

v) The balance the assignment matrix we have to:

(a) Open a dummy row

(b) Open a dummy column

(c) Open eigher a dummy row and column depending on the situation

(d) You cannot balanced assignment matrix

vi) The similarity between assignment problem and transportation problem is :

(a) Both are rectangular matrices

(b) Both are square matrices

(c) Both can be solved by graphical method

(d) Both have objective function and non negativity constraints

vii) CPM is

(a) Critical Project Management

(b) Critical Path Method

(c) Critical Path Management

(d) Crash Project Method

viii) Which of these is not correct?

(a) CPM is event-oriented

(b) PERT is probabilistic in nature

(c) CPM is deterministic in nature

(d) CPM and PERT use similar terminology but where developed independently

ix) Slack equals :

(a) LF - EF (b) EF - LF

(c) EF - LS (d) LF - ES

x) Monte-Carlo procedure is related to

(a) Simulation (b) Assignment

(c) Transportation (d) None of these

xi) A simulation model uses the mathematical expressions and logical relationships of the

(a) Real time

(b) Computer model

(c) Performance measures

(d) Estimated inferences

xii) When events occur at discrete points in time:

(a) A simulation clock is required

(b) The simulation advances to the next event

(c) The model is a discrete event simulation

(d) All of the alternatives are correct

xiii) A saddle point exists when :

(a) Maximin Value = Maximax Value

(b) Minimax Value = Minimin Value

(c) Minimax Value = Maximin Value

(d) None of these

xiv) If the value of the game is zero, then the game is known as :

(a) Fair strategy (b) Pure strategy

(c) Pure game (d) Mixed strategy

xv) In a mixed strategy game :

(a) No saddle point exists

(b) Each player selects the same strategy without considering other player's choice

(c) Each player always selects same strategy

(d) All of the above

Section - B

Short Answer Type Questions

$5 \times 5 = 25$

Q.2. Obtain an initial basic feasible solution to the following Transportation problem using North-West Corner Rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250	

OR

Prove that the number of basic variables of the general transportation problem at any stage of feasible solution must be m+n–1.

Q.3. What is assignment problem? Write mathematical formulation of assignment problem.

OR

What is General Non-Linear Programming Problem? Write the necessary conditions for maximum or minimum of $f(x_1, x_2)$ subject to constraints $g(x_1, x_2) = c$ and $x_1, x_2 \geq 0$, where C is constant.

Q.4. What is Network? Write its basic components.

OR

Write rules of Network construction.

Q.5. Classify simulation models.

OR

Write five advantages of simulation.

Q.6. Find saddle point for following (3×2) pay of matrix

		B_1	B_2	Player B
	A_1	9	2	
Player A	A_2	8	6	
	A_3	6	4	

OR

Two firms are competing for business under the condition so that on firm's gain is another firm's loss. Firms A's pay off matrix is given below:

		Firm B		
		No. ad	Medium ad	Heavy ad
Firm A	No. ad	10	5	–2
	Medium ad	13	12	15
	Heavy ad	16	14	10

Suggest optimum strategies for the two firms and net outcome thereof.

Section - C

Long Answer Type Questions

5×9=45

Q.7. A company manufacturing air coolers has two plants located at Mumbai and Calcutta with a weekly capacity of 200 units and 100 units respectively. The company supplies air coolers to its 4 show rooms situated at Ranchi, Delhi, Lucknow and Kanpur which have a demand of 75, 100, 100 and 30 units respectively. The cost of transportation per unit (in Rs.) is shown in the following table.

	Ranchi	Delhi	Lucknow	Kanpur
Mumbai	90	90	100	100
Calcutta	50	70	130	85

Obtain initial basic feasible solution by Vogel's Approximation Method (VAM).

OR

Given $x_{13} = 50$ units, $x_{14} = 20$ units

$x_{21} = 55$ units, $x_{31} = 30$ units

$x_{32} = 35$ units, $x_{34} = 25$ units

Is it an optimal solution to the transportation problem.

					Available units
	6	1	9	3	70
	11	5	2	8	55
	10	12	4	7	90
Required units	85	35	50	45	

If not, modify it to obtain a better feasible solution.

Q.8. A department head has four subordinates and four tasks to be performed. The sub-ordinates differ in efficiency and the tasks differ in their intrinsic difficulty, his estimate of the time, Each man would take to perform each task, is given in the matrix below:

	Men			
Tasks	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the task be allocated so as to minimize the total man hours.

OR

Solve the non-linear programming problem:

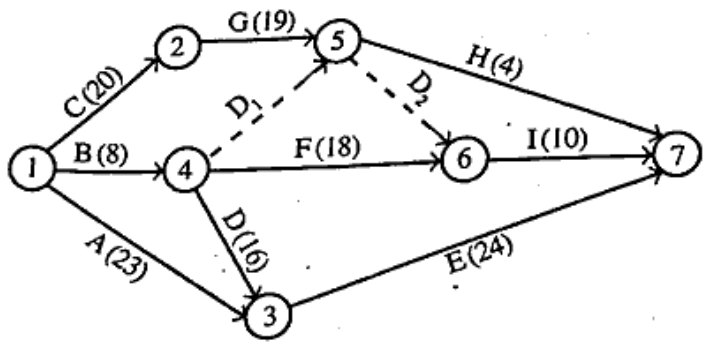
Optimize $z = 4x_1^2 + 2x_2^2 + x_3^2 - 4x_1x_2$

Subject to constraints $x_1 + x_2 + x_3 = 15$

$2x_1 - x_2 + 2x_3 = 20$

Q.9. For the following network diagram find total float, free float and independent float:

Task:	A	B	C	D	E	F	G	H	I
Time:	23	8	20	16	24	18	19	4	10



- - - - → Dummy Activity

——→ O - Node

OR

A project consists of eight activities with the following relevant information:

Activity	Immediate Predecessor	Estimated duration (days)		
		Optim-istic	Most Likely	Pessi mistic
A	-	1	1	7
B	-	1	4	7
C	-	2	2	8
D	A	1	1	1
E	B	2	5	14
F	C	2	5	8
G	D, E	3	6	15
H	F, G	1	2	3

i) Draw the PERT network and find out the expected project completion time

ii) What duration will have 95% confidence for project completion?

Q.10. Explain Monte-Carlo simulation with example.

OR

A Bakery keeps stock of a popular brand of cake Previous experience shows the daily demand pattern for the item with associated probabilities as given below:

Daily Demand:	0	10	20	30	40	50
Probability:	0.01	0.20	0.15	0.50	0.12	0.02

Use the following sequence of random numbers to simulate the demand for next 10 days.

Random numbers : 25, 39, 65, 76, 12, 05, 73, 89, 19,49.

Also estimate the daily average demand for the cakes on the basis of simulated date.

Q.11. Solve the following 2×4 game graphically

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	2	1	0	−2
	A_2	1	0	3	2

OR

Solve the following game by Linear programming technique.

	Player B		
Player A	1	−1	3
	3	5	−3
	6	2	−2

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