

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)
BSc DEGREE EXAMINATION DECEMBER 2019
(Fifth Semester)

Branch – MATHEMATICS

OPERATIONS RESEARCH

Time : Three Hours

Maximum : 75 Marks

SECTION-A (20 Marks)

Answer ALL questions

ALL questions carry EQUAL marks (10 x 2 = 20)

- 1 Define optimum solution.
- 2 Write the standard primal problem and dual problem.
- 3 Mention any two methods of finding an initial basic solution of a transportation problem.
- 4 Write the mathematical formulation of the assignment problem.
- 5 Define fair game and strictly determinable game.
- 6 Solve the game $\begin{bmatrix} 0 & 2 \\ -1 & 4 \end{bmatrix}$
- 7 Define Network.
- 8 Define Critical Path.
- 9 Write the elements of a Queueing system.
- 10 Define Queue.

SECTION - B (25 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 5 = 25)

- 11 a Obtain all the basic solutions to the following system of linear equation
 $x_1 + 2x_2 + x_3 = 4$
 $2x_1 + x_2 + 5x_3 = 5$
- OR
- b Obtain the dual problem of the following primal problem:
 Maximize $z = x_1 - 3x_2 - 2x_3$
 Subject to the constraints $3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 - 4x_2 \geq 12$, $-4x_1 + 3x_2 + 8x_3 = 10$,
 $x_1, x_2 \geq 0$ and x_3 is unrestricted.
- 12 a Obtain an initial basic feasible solution to the following transportation problem by NWC method.

	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

- b A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency, and the tasks differ in their intrinsic difficulty. His estimate, of the time each man would take to perform each matrix, is given in the matrix below.

Tasks	Men			
	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 tasks be allocated, one to a man so as to minimize the

- 13 a Solve the game.

$$\begin{array}{c} \text{H} \quad \text{T} \\ \text{H} \begin{bmatrix} 8 & -3 \end{bmatrix} \\ \text{T} \begin{bmatrix} -3 & 1 \end{bmatrix} \end{array}$$

OR

- b Solve the following game by using dominance property.

		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

- 14 a Explain about distinction between PERT and CPM.

OR

- b Construct the network diagram comprising activities B,C.... Q and N such the following constraints are satisfied.

$B < E, F$; $C < G, L$; $E, G < H$; $L, H < I$; $L < M$; $H < N$; $H < J$; $I, J < P$; $P < Q$.

The notation $X < Y$ means that the activities X must be finished before Y can begin.

- 15 a A T.V repairman find that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in and if the arrival of sets is approximately position with an average rate of 10 per 8 hour day. What is repairman's expected idl time each day? How many jobs are ahead of the average set just brought in?

OR

- b Explain about the model
- $\{(M|M|1):(N|FIFO)\}$
- .

SECTION - C (30 Marks)Answer any **THREE** Questions**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

- 16 Use Simplex method to solve the following LPP.

Maximize $z = 4x_1 + 10x_2$

Subject to the constraints $2x_1 + x_2 \leq 50$, $2x_1 + 5x_2 \leq 100$, $2x_1 + 3x_2 \leq 90$, $x_1 \geq 0$ and $x_2 \geq 0$.

- 17 Solve the following transportation problem

Destinations

		D ₁	D ₂	D ₃	D ₄	Supply
Origin	S ₁	3	7	6	4	5
	S ₂	2	4	3	2	2
	S ₃	4	3	8	5	3
Demand		3	3	2	2	

- 18 Obtain the optimal strategies for both-persons and the value of the game for zero sum two-person game whose pay off matrix is as follows:

	Player B	
Player A	1	-3
	3	5
	-1	6
	4	1
	2	2
	-5	0

- 19 A project consists of a series of tasks labeled A,B...H,I with the following relationships ($W < X, Y$ means X and Y cannot start until W is completed; $X, Y < W$ means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints:

$A < D, E$; $B, D < F$; $C < G$; $B, G < H$; $F, G < I$.

Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows:

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

- 20 A super market has two girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find
- (i) the probability that an arriving customer has to wait for service
 - (ii) the average number of customers in the system, and
 - (iii) the average time spent by a customer in the super-market.

Z-Z-Z

END