

**PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)**

**BBA DEGREE EXAMINATION DECEMBER 2024
(Second Semester)**

Branch – **BUSINESS ADMINISTRATION/ BUSINESS ADMINISTRATION (IS)
BUSINESS ADMINISTRATION (RM)**

APPLIED OPERATIONS RESEARCH

Time: Three Hours

Maximum: 50 Marks

SECTION-A (5 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** marks (5 x 1 = 5)

- 1 If there is no non-negative replacement ratio in the current solution which is to be improved, then the solution is
(i) Feasible (ii) Infeasible
(iii) Unbounded (iv) Degenerate
- 2 If we were to use opportunity cost value for non-basic cell to test optimality, it should be
(i) Negative Number (ii) Positive Number
(iii) Equal to zero (iv) Both (i) & (ii)
- 3 In general, sequencing problem will be solved by using
(i) Hungarian method (ii) Simplex method
(iii) Johnson & Bellman method (iv) Flood's technique
- 4 When the sum of one player is equal to the sum of losses to another player in a game, this situation is known as
(i) Fair game (ii) Zero sum game
(iii) Biased game (iv) None of the above
- 5 The activity which can be delayed without affecting the execution of the immediate succeeding activity is determined by
(i) Total float (ii) Free float
(iii) Independent float (iv) Interfering float

SECTION - B (15 Marks)

Answer **ALL** Questions

ALL Questions Carry **EQUAL** Marks (5 x 3 = 15)

- 6 a Explain the scopes of OR.
OR
b Write the standard and canonical form of LPP.
- 7 a Determine the starting solution in the following transportation problem by using North West Corner Method.

	D1	D2	D3	D4	Supply
S1	3	7	6	4	5
S2	2	4	3	2	2
S3	4	3	8	5	3
Demand	3	3	2	2	

OR

Cont...

- b Consider the following transportation problem:

origin					Availability
	D1	D2	D3	D4	
O1	5	8	3	6	30
O2	4	5	7	4	50
O3	6	2	4	6	20
Demand	30	40	20	10	100

Determine an initial basic feasible solution using Vogel's Approximation method.

- 8 a A book binder has one printing press, one binding machine, and the manuscripts of a number of different books. The time required to perform the printing and binding operations for each book is shown below. Determine the order in which books should be processed, in order to minimize the total time required to turn out all the books:

Book	1	2	3	4	5	6
Printing Time (Hrs.)	30	120	50	20	90	100
Binding Time (Hrs.)	80	100	90	60	30	10

OR

- b A machine costs Rs. 9000. Annual operating costs are Rs. 200 for the first year, and then increase by Rs. 2000 every year. Determine the best age at which to replace the machine. If the optimum replacement policy is followed. What will be the average yearly cost of owning and operating the machine?

- 9 a Explain the Maximin and Minimax principle of game theory.

OR

- b The rate of arrival of customers at a public telephone booth follows Poisson distribution, with an average time of 10 minutes between one customer and the next. The duration of a phone call is assumed to follow exponential distribution, with mean time of 3 minutes.

- (i) What is the probability that a person arriving at the booth will have to wait?
(ii) What is the average length of the non-empty queues that form from time to time?

- 10 a Draw the network diagram and indicate all the possible paths for the following:

Activity	1-2	1-3	2-3	2-4	3-4	4-5
Duration (Days)	20	25	10	12	6	10

OR

- b Distinguish between the PERT and CPM.

SECTION -C (30 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks

(5 x 6 = 30)

- 11 a Solve the following LPP by graphical method

$$\text{Minimize } Z = 5X_1 + 8X_2$$

Subject to the constraints

$$X_1 \leq 4, X_2 \geq 2, X_1 + X_2 = 5$$

$$\text{And } X_1, X_2 \geq 0$$

OR

Cont...

- b Explain the solving procedure of simplex method.

- 12 a The distribution system has the following constraints and the transportation cost per unit (in rupees) allocated with each route are given:

		To			Capacity
		I	II	III	
From	A	10	7	8	45
	B	15	12	9	15
	C	7	8	12	40
Demand		25	55	20	

Find the optimal transportation schedule and the minimum total cost of the transportation.

OR

- b Explain the solving procedure of an assignment (Hungarian) method.

- 13 a Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information processing time on machines is given in hours and passing is not allowed:

Job	A	B	C	D	E	F	G
Machine M ₁	3	8	7	4	9	8	7
Machine M ₂	4	3	2	5	1	4	3
Machine M ₃	6	7	5	11	5	6	12

OR

- b Discuss in brief replacement procedure for the item that deteriorate with time.

- 14 a Solve the game whose pay – off matrix is given below and also identify the value of the game.

	B1	B2	B3	B4	B5
A1	9	3	1	8	0
A2	6	5	4	6	7
A3	2	4	3	3	8
A4	4	6	2	2	1

OR

- b Elucidate the characteristics of a queuing system.

- 15 a For the given data draw a network and find the critical path.

Activity	1-2	2-3	2-4	3-4	3-5	3-6	4-5	5-6
Duration (Days)	5	6	5	0	7	7	6	6

OR

- b A project has the following characteristics and time estimates:

Activity	Estimated duration (days)		
	Optimistic time	Most likely time	Pessimistic time
1—2	12	14	21
1—3	7	10	16
3—5	4	6	10
3—4	36	40	60
4—6	12	15	24
5—6	6	8	12
6—7	9	12	18
6—8	6	10	15
7—8	4	5	7
8—9	8	10	14

Construct the network diagram and the find the critical path. Determine the project completion time and its variance.

Z-Z-Z

END

