

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

BBA DEGREE EXAMINATION MAY 2024
(Second Semester)

Common to Branches – **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 Linear programming problem (LPP) must have an
 - (i) Objective (goal) that we aim to maximize or minimize
 - (ii) Constraints (restriction) that we need to specify
 - (iii) Decision variables (activities) that we need to specify
 - (iv) all of above
- 2 The solution to a transportation problem with m-sources and n- destinations is feasible, if the number of allocations are
 - (i) $m+n-1$
 - (ii) $m+n+1$
 - (iii) $m+n$
 - (iv) $m \times n$
- 3 Sequencing problem involving processing of two jobs on 'n' machines
 - (i) can be solved graphically
 - (ii) cannot be solved graphically
 - (iii) have a condition that the processing of two jobs must be in the same order
 - (iv) none of these
- 4 If the pay – off matrix of a game is transposed,
 - (i) Value of the game does not change
 - (ii) saddle point of the game, if exists, changes
 - (iii) optimum strategies of both players does not change
 - (iv) none of the above
- 5 In critical path analysis, the word CPM mean
 - (i) Critical Path Method
 - (ii) Crash Project Management
 - (iii) Critical Project Management
 - (iv) Critical Path Managment

SECTION - B (15 Marks)

Answer ALL Questions

ALL Questions Carry EQUAL Marks

(5 x 3 = 15)

- 6 a. Discuss in detail about the nature and scope of Operations Research.

OR

b. A company has three operational departments (weaving, processing and packing) with capacity to produce three different types of clothes namely suiting, shirting and woollens yielding a profit of Rs.2, Rs.4, Rs.3 per metre respectively. One metre of suiting requires 3 minutes in weaving, 2 minutes in processing and minutes in packing. Similarly one metre of shirting requires 4 minutes in weaving, 1 minute in processing and 3 minutes in packing. One metre of wollen requires 3 minutes in each department. In a week, total run time of each department is 60,40,80 hours for weaving, processing and packing respectively. Formulate the LPP to find the product mix to maximize the profit.

Cont...

- 7 a Obtain the initial basic feasible solution by North-west Corner rule

		Destination			
Source		A	B	C	Supply
	1	2	7	4	5
	2	2	3	1	8
	3	5	4	7	7
	4	1	6	2	14
		7	9	18	34

OR

- b Explain the difference between Transportation problem and Assignment problem.
- 8 a The cost of a machine is 61,000/- and its scrap value is 1,000/-. The maintenance costs found from the past experiences are

Yr	1	2	3	4	5	6	7	8
M.C	1000	2500	4000	6000	9000	12000	16000	20000

Yr-Year, M.C – Maintenance cost (rupees)
When should the machine be replaced?

OR

- b We have seven jobs, each of which has to go through the machines M_1 and M_2 in the order M_1M_2 . Processing time (in hours) are given as follows:

Job	1	2	3	4	5	6	7
Machine 1	3	12	15	6	1	11	9
Machine 2	8	10	10	6	12	1	3

Determine a sequence of these jobs that will minimize the total elapsed time.

- 9 a For the game with the following pay off matrix, determine the optimum strategies and the value of the game:

$$P_2 \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$$

OR

- b Customers arrive at a milk booth at a rate of 5 per hour and they get service at the rate of 8 per hour. Determine the following:
- Probability that there is no customer at milk booth.
 - Expected time that a customer is in the queue
 - Expected number of customers in the waiting line.

- 10 a Construct a Network for the following:

Activities	A	B	C	D	E	F	G	H	I
Immediate Predecessor	-	-	A,B	B	B	A,B	F,D	F,D	C,G

OR

- B Summarize the difference between CPM and PERT.

SECTION -C (30 Marks)

Answer ALL questions

ALL questions carry EQUAL Marks

(5 x 6 = 30)

- 11 a Solve Graphically
Max $Z = 4x_1 + 3x_2$
Subject to the constraints
 $2x_1 + x_2 \leq 1000, x_1 + x_2 \leq 800,$
 $x_1 \leq 400$ and $x_2 \leq 700,$
 $x_1 \geq 0, x_2 \geq 0$

OR

Cont...

- b Use simplex method to solve the following LPP

Maximize $z=4x_1+10x_2$

Subject to the constraints:

$$2x_1+x_2 \leq 50;$$

$$2x_1+5x_2 \leq 100;$$

$$2x_1+3x_2 \leq 90;$$

$$x_1 \geq 0 \text{ and } x_2 \geq 0$$

- 12 a Solve the following transportation problem

		Destination				
Sources		P	Q	R	S	Supply
	A	21	16	25	13	11
	B	17	18	14	23	13
	C	32	17	18	41	19
	Demand	6	10	12	15	43

OR

- b Solve the assignment problem in order to minimize the total cost

	1	2	3	4	5
A	10	3	3	2	8
B	9	7	8	2	7
C	7	5	6	2	4
D	3	5	8	2	4
E	9	10	9	6	10

13. a Find an optimal sequence for processing nine jobs through the machines A, B, C in the order ABC. Processing times are given below in hours. Find the total elapsed time for the optimal sequence.

Jobs	1	2	3	4	5	6	7	8	9
Machine A	4	9	5	10	6	12	8	3	8
Machine B	6	4	8	9	4	6	2	6	4
Machine C	10	12	9	11	14	15	10	14	12

OR

- b The cost of a new machine is Rs. 5000. The maintenance cost of nth year is given by $C_n = 500(n-1)$; $n=1,2,\dots$. Suppose that the discount rate per year is 0.05. After how many years it will be economical to replace the machine by a new one?

- 14 a Solve the following game after reducing it to 2×2 game:

Player B

Player A	1	7	2
	6	2	7
	5	1	6

OR

- b A T.V mechanic finds 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 come in. If the arrival of sets is approximately Poisson with an average rate of 10 per eight-hour day, what is the mechanic's expected idle time each day? How many jobs are ahead of the average set just brought in?

Cont...

- 15 a The following table shows the jobs of a network along with their time estimates

Job	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
a	1	2	2	2	7	5	5	3	8
m	7	5	14	5	10	5	8	3	17
b	13	14	26	8	19	17	29	9	32

Draw the project network and find the probability of the project completing in 40 days.

OR

- b Consider the following project

Activity	Time estimate in weeks			Predecessor
	t_0	t_m	t_p	
A	3	6	9	NONE
B	2	5	8	NONE
C	2	4	6	A
D	2	3	10	B
E	1	3	11	B
F	4	6	8	C,D
G	1	5	15	E

Find the path and standard deviation. Also find the probability of completing the project by 18 weeks.

Z-Z-Z

END