

**PSG COLLEGE OF ARTS & SCIENCE**  
(AUTONOMOUS)  
**BCom DEGREE EXAMINATION MAY 2019**  
(Second Semester)

**Branch - COMMERCE (BUSINESS ANALYTICS)**

**OPTIMIZATION TECHNIQUES**

Time: Three Hours

Maximum: 75 Marks

**SECTION-A (10 Marks)**

Answer **ALL** questions

**ALL** questions carry **EQUAL** marks

(10x1 = 10)

- 1 The set of feasible solution to an LPP is a  
(i) Concave (ii) Feasible (iii) Convex (iv) None
- 2 Linear programming problem must have an  
(i) Objective that we aim to maximize or minimise  
(ii) Constraints that we need to specify  
(iii) Decision variable that we need to determine  
(iv) All of the above
- 3 The solution to a transportation problem with m sources and n destination is feasible, if the number of allocations are  
(i) m-t-n-1 (ii) m+n+1 (iii) m+n (iv) mxn
- 4 The method used for solving an assignment problem is called  
(i) MODI method (ii) Reduced matrix method  
(iii) Hungarian method (iv) None of the above
- 5 In sequencing problem the time for which a machine does not have to process is called  
(i) processing time (ii) elapsed time (iii) idle time (iv) total time
- 6 The rule of maintaining the order in which jobs are to be processed on given machines is known as  
(i) process order (ii) No passing rule  
(iii) job sequence (iv) processing rule
- 7 A dummy activity is used in the network diagram when  
(i) two parallel activities have the same tail and diagram when  
(ii) the chain of activities may have a common event yet to be independent by themselves  
(iii) both (i) & (ii) (iv) None of the above
- 8 In PERT the activity duration follows  
(i) Binomial distribution (ii) Poisson distribution  
(iii) Beta distribution (iv) Normal distribution
- 9 What happens when maximum and minimax values of the game are same?  
(i) No solution exists (ii) solution is mixed  
(iii) saddle point exists (iv) none of above
- 10 Each player should follow the same strategy regardless of the other player's strategy in which of the following games?  
(i) Pure strategy (ii) Mixed strategy  
(iii) Dominance strategy (iv) Constant strategy

**SECTION - B 125 Marks)**

Answer **ALL** questions

**ALL** questions carry **EQUAL** Marks (5 x 5 = 25)

- 11 a The manager of an Oil refinery must decide on the optimum mix of two possible blending process of which the input and output production runs are as follows:

Process	<u>Input</u>		<u>Output</u>	
	Crude A	Crude B	Gasoline X	Gasoline Y
1	6	4	6	9
2	5	6	5	5

**Cont...**

11 a Cont...

The maximum amounts available of Crudes A and B are 250 and 200 units respectively. Market demand shows that atleast 150 units of gasoline X and 130 units of gasoline Y must be produced. The profits per production run from process 1 and process 2 are Rs.4 and Rs.5 respectively. Formulate the problem for maximizing the profit.

OR

- b A farm is engaged in breeding pigs. The pigs are fed on various products grown on the farm. In view of the need to ensure certain nutrient constituents (call them X,Y,Z), it is necessary to buy two additional products, say A and B. One unit of product A contains 36 units of X, 3 unit of Y and 20 units of Z. One unit of product B contains 6 units of X, 12 units of Y and 10 units of Z. The minimum requirement of X,Y,Z is 108 units and 100 units respectively. Product A costs Rs.20 per unit and Product B Rs.40 per unit.

Formulate the above as a linear programming problem to minimize the total cost, and solve the problem by using graphic method.

12 a Obtain an initial basic feasible solution to the following T.P using matrix maxima method.

	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	Capacity
O <sub>1</sub>	1	2	3	4	6
O <sub>2</sub>	4	3	2	0	8
O <sub>3</sub>	0	2	2	1	10
Demand	4	6	8	6	

where O<sub>i</sub> and D<sub>j</sub> denote i<sup>th</sup> origin and j<sup>th</sup> destination respectively.

OR

- b Solve the following Assignment problem.

	I	II	III	IV
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

13 a Show that the game  
Player B

Player A | "Q" " " is not strictly determinable.

OR

- b For the game with following pay off matrix, determine the optimum strategies and the value of the game.

	P <sub>2</sub>	
P <sub>1</sub>	5	1
	3	4

14 a Draw a network diagram for the following data:

Activity	A	B	C	D	E	F	A	H	I	J
Proceeding activities	None	A	A	B	A	B, E	C	D, F	G	H, I

OR

- b Write the rule for network construction.

15 a In a factory there are six jobs to perform, each of which should go through two machines A and B in the order A, B. The processing timings (in hours) for the jobs are given here. You are required to determine the sequence for performing the jobs that would minimize the total elapsed time T. What is the value of T?

Job	h	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	J <sub>5</sub>	J <sub>6</sub>
Machine A	1	3	8	5	6	3
Machine B	5	6	3	2	2	10

OR

- b We have five jobs each of which must go through the two machines A and B in the order AB. Processing times in hours are given in the table below.

Job (i)	1	2	3	4	5
Machine (A,)	5	1	9	3	10

**SECTION -C (40 Marks)**

Answer ALL questions  
 ALL questions carry EQUAL Marks (5 x 8 = 40)

16 a Rolls of paper having a fixed length and width of 180cm are being manufactured by a paper mill. These rolls have to be cut to satisfy the following demand:

Width	80 cm	45 cm	27 cm
No. of Rolls	200	120	130

Obtain the linear programming formulation of the problem to determine the cutting pattern, so that the demand is satisfied and wastage of paper is a minimum.

OR

b Use graphical method to solve the LPP.

Maximize  $Z=2X_1+3X_2$

subject to  $X_1+X_2<30, X_1-X_2<0, X_2>3$

$0<X_1<20$  and  $0<X_2<12$ .

17 a Solve the following transportation problem.

Origin	Destination				Availability
	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
O <sub>1</sub>	1	2	1	4	30
O <sub>2</sub>	3	3	2	1	50
O <sub>3</sub>	4	2	5	9	20
Requirement	20	40	30	10	

OR

Solve the following assignment problem.

	I	II	III	IV
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

18 a Solve the following 2x2 game graphically.

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	2	1	0	-2
	A <sub>2</sub>	1	0	3	2

OR

Solve the following game.

		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

19 a A small project is composed of seven activities whose time estimates are listed in the table as follows:

Activity	J	Estimated duration (weeks)		
		Optimistic	Most likely	Pessimistic
1	2	1	1	7
1	3	1	4	7
1	4	2	2	8
2	5	1	1	1
3	5	2	5	14
4	6	2	5	8
5	6	3	6	15

(i) Draw a project network.

(ii) Find the expected duration and variance of each activity. What is the expected project length.

19 Cont...

- b A small project consists of seven activities for which the relevant data are given below:

Activity	Preceding Activities	Activity Duration
A	.	4
B	.	7
C	.	6
D	A,B	5
E	A,B	7
F	C,D,E	6
G	C,D,E	5

- (i) Draw the networks and find the project completion time.  
(ii) Calculate total float for each of the activities and highlight the critical path.

- 20 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 I	3	8	7	4	9	8	7
Machine II	4	3	2	5	1	4	3
Machine III	6	7	5	11	5	6	12

OR

- b Determine the optimal sequence of jobs that minimizes the total elapsed time based on the following information.

Job	1	2	3	4	5	6	7
Machine I	10	8	12	6	9	11	9
Machine II	6	4	6	5	3	4	2
Machine III	8	7	5	9	10	6	5