

PSG COLLEGE OF ARTS & SCIENCE  
(AUTONOMOUS)

BSc DEGREE EXAMINATION MAY 2022  
(Fourth Semester)

Branch – COMPUTER SCIENCE WITH DATA ANALYTICS

**OPTIMIZATION TECHNIQUES**

Time: Three Hours

Maximum: 75 Marks

**SECTION-A (10 Marks)**

Answer ALL questions

ALL questions carry EQUAL marks (10 x 1 = 10)

1. The structural optimization problem is generally expressed as \_\_\_\_\_  
(i) Maximize  $Z = F(x)$  (ii) Minimize  $Z = F(x)$   
(iii)  $Z = F(x)$  (iv)  $Z = F(t)$
2. Solution of a LPP when permitted to be infinitely large is called \_\_\_\_\_  
(i) Unbounded (ii) Bounded  
(iii) Optimum solution (iv) No solution
3. For finding an optimum solution in transportation problem \_\_\_\_\_ method is used.  
(i) Modi (ii) Hungarian  
(iii) Graphical (iv) Simplex
4. The assignment algorithm was developed by \_\_\_\_\_  
(i) MODI (ii) HUNGARIAN  
(iii) HUHNS (iv) VOGELS
5. If there is non-negative replacement ratio in a solution which is sought to be improved, then the solution is \_\_\_\_\_  
(i) Bounded (ii) Unbounded  
(iii) Basic solution (iv) Non-basic solution
6. The problem of replacement happens when job performing units fail \_\_\_\_\_  
(i) Suddenly and gradually (ii) suddenly  
(iii) Gradually (iv) Neither gradually nor suddenly
7. Given arrival rate = 30/hr, Service rate = 40/hr, The value of traffic intensity is \_\_\_\_  
(i)  $\frac{4}{3}$  (ii)  $\frac{3}{4}$  (iii)  $\frac{3}{2}$  (iv) 5
8. In a petrol bunk, Vehicles arrive at the average of 12 per hour; the service time is 4 minutes. The pumps are expected to be idle for.  
(i) 33% (ii) 43% (iii) 53% (iv) 65%
9. A \_\_\_\_\_ can have more than one critical path.  
(i) Network (ii) Customer  
(iii) Server (iv) Assignment problem
10. What is PERT analysis based on?  
(i) Optimistic time (ii) pessimistic time  
(iii) Most likely time (iv) All the above

**SECTION - B (35 Marks)**

Answer ALL Questions

ALL Questions Carry EQUAL Marks (5 x 7 = 35)

- 11 a State the standard form of linear programming problem and explain.

OR

- b Use the simplex method to find the maximum value of  $Z = 2x_1 - x_2 + 2x_3$   
Subject to

$$\begin{aligned} 2x_1 + x_2 &\leq 10 \\ x_1 + 2x_2 - 2x_3 &\leq 20 \\ x_2 + 2x_3 &\leq 5 \end{aligned}$$

where  $x_1 \geq 0, x_2 \geq 0$  and  $x_3 \geq 0$ .

Cont...

- 12 a A mobile phone manufacturing company has three branches located in three different regions; say Jaipur, Udaipur and Mumbai. The company has to transport mobile phones to three destinations, say Kanpur, Pune and Delhi. The availability from Jaipur, Udaipur and Mumbai is 40, 60 and 70 units respectively. The demand at Kanpur, Pune and Delhi are 70, 40 and 60 respectively. The transportation cost is shown in the matrix below (in Rs). Use the Least Cost method to find a basic feasible solution (BFS).

		Destinations			Supply
		Kanpur	Pune	Delhi	
sources	Jaipur	4	5	1	40
	Udaipur	3	4	3	60
	Mumbai	6	2	8	70
Demand		70	40	60	170

(OR)

- b Explain the Vogel's Approximation method.
- 13 a Suppose that there are five jobs, each of which has to be processed on two machines A and B in the order AB. Processing times are given in the following table:

Jobs	1	2	3	4	5
Machine A	6	2	10	4	11
Machine B	3	7	8	9	5

Determine a sequence in which these jobs should be processed so as to minimize the total processing time.

(OR)

- b Explain the Assumption of sequence problem.
- 14 a Solve the game whose pay-off matrix is given in the following table as follows:

		Player B	
		1	2
Player A	1	1	3
	2	-1	6

(OR)

- b In a bank there is only one window. A solitary employee performs all the service required and the window remains continuously open from 7am to 1pm. It has discovered that an average number of clients is 54 during the day and the average service time is 5 mins / person. Find a) Average number of clients in the system b) Average waiting time c) The probability that a client has to spend more than 10mins in a system.

- 15 a Find out the critical path and duration of following project network:

Activity	Duration	Predecessor
A	2	NIL
B	4	A
C	3	A
D	6	B,C
E	7	B
F	3	D,E

(OR)

- b Distinguish between PERT and CPM.

**SECTION - C (30 Marks)**

Answer any **THREE** Questions

**ALL** Questions Carry **EQUAL** Marks (3 x 10 = 30)

16 Solve the following LPP by using simplex method.

$$\text{Max. } Z = 7x_1 + 5x_2$$

Subject to Constraints  $x_1 + 2x_2 \leq 6$

$$4x_1 + 3x_2 \leq 12$$

$$x_1, x_2 \geq 0$$

17 Solve the transportation problem using North-West Corner method.

	D1	D2	D3	D4	Supply
S1	19	30	50	10	7
S2	70	30	40	60	9
S3	40	8	70	20	18
Demand	5	8	7	14	

18 Find the sequence that minimizes the total time required in performing the following jobs on three machines in order ABC. Processing times (in hours) are given in the following table :

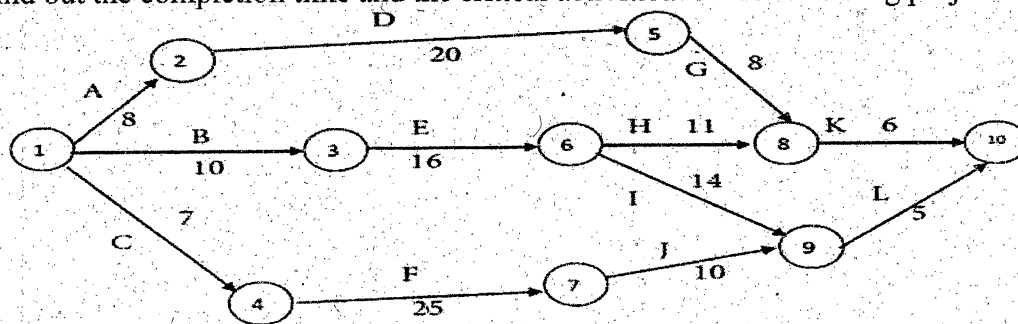
Jobs	1	2	3	4	5
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

Determine a sequence in which these jobs should be processed so as to minimize the total processing time.

19 Find the optimal plan for both the player.

		PLAYER B			
		I	II	III	IV
PLAYER A	I	-2	0	0	5
	II	4	2	1	3
	III	-4	-3	0	-2
	IV	5	3	-4	2

20 Find out the completion time and the critical activities for the following project



Z-Z-Z

END