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Code No. : 20238 E      Sub. Code : SMCA 43/  
AMCA 43

B.C.A. (CBCS) DEGREE EXAMINATION,  
NOVEMBER 2022.

Fourth Semester

Computer Application – Core

RESOURCE MANAGEMENT TECHNIQUES

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer.

1. Which statement characterizes standard form of a linear programming problem?
  - (a) Constraints are given by inequalities of any type
  - (b) Constraints are given by a set of linear equations
  - (c) Constraints are given only by inequalities of  $\geq$  type
  - (d) Constraints are given only by inequalities of  $\leq$  type

2. In the feasible region of a LPP is empty , then the solution is \_\_\_\_\_.
- (a) Infeasible                      (b) Unbounded  
(c) Alternative                    (d) None of these
3. The main objective of an assignment problem is to
- (a) Minimize the total cost  
(b) Maximize the sales and returns  
(c) Both (a) and (b).  
(d) Normal
4. When the number of rows is equal to the number of columns then the problem is said to be \_\_\_\_\_ assignment problem.
- (a) Balanced                      (b) Unbalanced  
(c) Both (a) and (b)            (d) Feasible
5. In sequencing problem, the order of completion of jobs is called
- (a) Completion sequence  
(b) Job sequence  
(c) Processing order  
(d) Job order

6. A \_\_\_\_\_ is a connected network that may involved only one subset of all nodes of the network.
- (a) Branches                      (b) Tree  
(c) Loop                          (d) All of these
7. CPM stands for
- (a) Critical Path Method  
(b) Critical Programme Module  
(c) Critical Perform Method  
(d) Cost Path Method
8. An \_\_\_\_\_ is a task, or item of work to be done, that consume time, effort, money or other resources.
- (a) Event                          (b) Activity  
(c) Evaluation                    (d) Condition
9. The participants in a game are called
- (a) Clients                          (b) Members  
(c) Customers                    (d) Players

10. Inventory models with all the known parameters with certainty are known as \_\_\_\_\_ model
- Unknown cost structure
  - Deterministic inventory
  - Known cost structure
  - Dynamic Demand

PART B — ( $5 \times 5 = 25$  marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) A ship has three cargo holds, forward, aft and center. The capacity limits are:  
 Forward 2000 tons, 100,000 cubic meters  
 Center 3000 tons, 135,000 cubic meters  
 After 1500 tons, 30,000 cubic meters.

The following cargoes are offered, the ship owners may accept all or any part of each commodity:

Commodity	Amount in tons.	Volume/ton in cubic meters	Profit per ton in Rs.
A	6000	60	60
B	4000	50	80
C	2000	25	50

In order to preserve the trim of the ship the weight in each hold must be proportional to

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the capacity in tons. How should the cargo be distributed so as to maximize profit? Formulate this as linear programming problem.

Or

- (b) Describe about the steps for Simplex method of linear programming
12. (a) Clarify about the procedures of Hungarian method.

Or

- (b) The owner of a small machine shop has four mechanics available to assign jobs for the day. Five jobs are offered with expected profit for each mechanic on each job which are as follows:

		Job				
		A	B	C	D	E
Mechanic	1	62	78	50	111	82
	2	71	84	61	73	59
	3	87	92	111	71	81
	4	48	64	87	77	80

Find by using the assignment method, the assignment of mechanics to the job that will result in a maximum profit. Which job should be declined?

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13. (a) Explain the minimum spanning tree algorithm.

Or

- (b) Clarify about the various types of Job Sequencing problem.

14. (a) Explain the terms: critical path, critical activities.

Or

- (b) A small project is composed of 7 activities whose time estimates are listed below. Activities are being identified by their beginning (i) and ending (j) node numbers.

Activities Time in weeks

i	j	$t_o$	$t_i$	$t_p$
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 the network

- (ii) Calculate the expected variances for each

- (iii) Find the expected project completed time

- (iv) Calculate the probability that the project will be completed at least 3 weeks than expected

- (v) If the project due date is 18 weeks, what is the probability of not meeting the due date?

15. (a) Solve the game with the following pay-off matrix.

Player B

strategies

I II III IV V

Palyer A strategies	1	7	5	2	3	9
	2	10	8	7	4	5
	3	9	12	0	2	1
	4	11	-2	-1	3	4

Or

- (b) Consider a situation where the mean arrival rate (1) is one customer every 4 minutes and the mean service time (m) is  $2\frac{1}{2}$  minutes. Calculate the average number of customers

in the system, the average queue length and the time taken by a customer in the system and the average time a customer waits before being served.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. Solve by Big M method.

(a) Maximize  $Z = x_1 + 2x_2 + 3x_3 - x_4$

Subject to the constraints

$$x_1 + 2x_2 + 3x_3 = 15$$

$$2x_1 + x_2 + 5x_3 = 20$$

$$x_1 + 2x_2 + x_3 + x_4 = 10$$

Or

(b) Maximize  $z = 4x_1 + 3x_2$

Subject to

$$2x_1 + 3x_2 \leq 6$$

$$-3x_1 + 2x_2 \leq 3$$

$$2x_2 \leq 5$$

$$2x_1 + x_2 \leq 4$$

17. (a) Four different jobs can be done on four different machines and take down time costs are prohibitively high for change overs. The following matrix gives the cost in rupees of producing job  $i$  on machine  $j$ :

	Machine			
Jobs	M <sub>1</sub>	M <sub>2</sub>	M <sub>3</sub>	M <sub>4</sub>
J <sub>1</sub>	5	7	11	6
J <sub>2</sub>	8	6	9	6
J <sub>3</sub>	4	7	10	7
J <sub>4</sub>	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized?

Or

(b) Write the comparison between AP and TP.

18. (a) Explain the basic features and advantages of network models.

Or

- (b) Develop a network diagram for the project specified below:

Activity	Immediate predecessor activity
A	—
B	A
C,D	B
E	C
F	D
G	E,F

19. (a) The following details are available regarding a project:

Activity	Immediate predecessor activity	Duration (weeks)
A	—	3
B	A	5
C	A	7
D	B	10
E	C	5
F	D,E	4

Determine the critical path, the critical activities and the project completion time.

Or

- (b) Write the similarities and differences between CPM and PERT.

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20. (a) Solve the game with the following pay-off matrix:

		Player B			
		I	II	III	IV
Player A	1	4	2	3	6
	2	3	4	7	5
	3	6	3	5	4

Or

- (b) Find the optimal order quantity for a product for which the price breaks are as follows:

Quantity	Price in Rs. per unit
$0 \leq q < 100$	20
$100 \leq q < 200$	18
$200 \leq \infty$	16

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost and the ordering cost is Rs. 25 per order.