





14. What is Free Float ?
15. Write a note on EOL
16. What is basic feasible solution in transportation problem ?
17. What is zero sum game ?
18. Explain decision node decision tree.
19. Explain optimal solution in LPP.
20. Explain Decision trees.

(8 × 2 = 16 marks)

**Part III**

*Answer any six questions.  
Each question carries 4 marks.*

21. Discuss the advantages of Operation Research.
22. State Application of Linear Programming problem.
23. Discuss the difference between PERT and CPM.
24. Explain the methods of finding the initial feasible solution in transportation problem.
25. Write a short note on Decision theory.
26. Construct network diagram and determine critical path and project duration :

Job	Predecessor	Job	Predecessor	Job	Predecessor
A	–	F	A	L	G, H
B	–	G	F	M	J, K, L
C	A	H	D, E	N	J, K, L
D	A	J	G, H	O	K, J
E	B, C	K	G, H		

27. A factory manufactures two products A and B. To manufacture one unit of A, 1.5 machine hours and 2.5 labour hours are required. To manufacture product B, 2.5 machine hours and 1.5 labour hours are required. In a month, 300 machine hours and 240 labour hours are available. Profit per unit for A is Rs. 50 and for B is Rs. 40. Formulate as LPP.

**Turn over**

28. A decision maker faced with three decision alternatives and four states of nature constructs the following pay off table :

States of Nature	Acts			
	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
S <sub>1</sub>	5	10	18	25
S <sub>2</sub>	8	7	8	23
S <sub>3</sub>	21	18	12	21
S <sub>4</sub>	30	22	19	20

Determine the alternative to be chosen under :

- (i) Maximax Criterion ;
- (ii) Maximin Criterion ; and
- (iii) Minimax Regret Criterion.

(6 × 4 = 24 marks)

#### Part IV (Long Essays)

Answer any **two** questions.  
Each question carries 15 marks.

29. Solve the Linear Programming Problem graphically :

$$\begin{aligned} \text{Minimize } Z &= 40X_1 + 80X_2 \\ \text{subject to constraints : } &72X_1 + 12X_2 \geq 216 \\ &6X_1 + 24X_2 \geq 72 \\ &40X_1 + 20X_2 \geq 200 \\ &X_1, X_2 \geq 0. \end{aligned}$$

30. The time estimates of a project are given (in days) below :

- (a) Draw the project network
- (b) Identify all paths through it and write critical path.
- (c) Determine the expected project length and standard deviation.
- (d) What is the probability that project will be completed in 35 days ?

5

Activity	$t_o$	$t_m$	$t_p$
1-2	6	12	30
1-3	3	6	15
1-4	3	9	27
2-6	4	19	28
3-5	3	9	27
3-6	2	5	8
4-5	1	4	7
5-6	6	12	30

31. Find the initial basic feasible solution to the given transportation problem using the North-west corner rule :

From					SUPPLY
	D1	D2	D3	D4	
O1	11	13	17	14	250
O2	16	18	14	10	300
O3	21	24	13	10	400
DEMAND	200	225	275	250	

(2 × 15 = 30 marks)

C 40890

(Pages : 4)

Name.....

Reg. No.....

**FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION  
APRIL 2023**

B.B.A.

BBA IV C 04—MANAGEMENT SCIENCE

(2017—2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

**Part I***Answer all questions.**Each question carries 1 mark.*

1. Operations Research approach is \_\_\_\_\_.
  - a) Multi-disciplinary.
  - b) Scientific.
  - c) Intuitive.
  - d) Collect essential data.
2. The Operations research technique which helps in minimizing total waiting and service costs is :
  - a) Queuing Theory.
  - b) Decision Theory.
  - c) Both a) and b).
  - d) None of the above.
3. A set of feasible solution to a Linear Programming Problem is \_\_\_\_\_.
  - a) Convex.
  - b) Polygon.
  - c) Triangle.
  - d) Bold.
4. NWCM stands for \_\_\_\_\_.
  - a) North West Corner Method.
  - b) North West Common Method.
  - c) North West Conjunction Method.
  - d) Normal Wealth Corner Method.
5. An optimal Assignment requires that the maximum number of lines which can be drawn through squares with zero opportunity cost should be equal to the number of \_\_\_\_\_.
  - a) Rows or columns.
  - b) Rows and columns.
  - c) Rows + columns – 1.
  - d) Rows-columns.

**Turn over**



18. What are slack and surplus variables ?  
 19. Define decision variable.  
 20. What is float in network diagram ?

(8 × 2 = 16 marks)

**Part III (Short Essay Questions)**

*Answer any six questions.  
 Each question carries 4 marks.*

21. Explain Phases of operations research.  
 22. Distinguish between Free, Interfering and Independent floats.  
 23. Discuss the assumptions of game theory.  
 24. Explain the terms a) Expected Monetary value ; and b) Expected opportunity loss criteria.  
 25. Discuss the essential characteristics of Linear Programming Problem.  
 26. Draw a network diagram from the following activities :

Job	Predecessor	Job	Predecessor	Job	Predecessor
A	–	F	A	L	G, H
B	–	G	F	M	J, K, L
C	A	H	D, E	N	J, K, L
D	A	J	G, H	O	K, J
E	B, C	K	G, H		

27. A factory manufactures two products A and B. To manufacture one unit of A, 1.5 machine hours and 2.5 labour hours are required. To manufacture product B, 2.5 machine hours and 1.5 labour hours are required. In a month, 300 machine hours and 240 labour hours are available.  
 Profit per unit for A is Rs. 50 and for B is Rs. 40. Formulate as LPP.  
 28. Obtain an Initial BFS to the following Transportation problem using VAM method ?

Origin	Destination				Supply
	1	2	3	4	
1	20	22	17	4	120
2	24	37	9	7	70
3	32	37	20	15	50
Demand	60	40	30	110	240

(6 × 4 = 24 marks)

**Turn over**

**Part IV (Long Essays)**

*Answer any two questions.  
Each question carries 15 marks.*

29. Solve the given LPP using the graphical method.

$$\text{Maximize } Z = 4x + y$$

subject to the constraints :

$$x + y \leq 50$$

$$3x + y \leq 90$$

$$x \geq 0, y \geq 0.$$

30. A Consider the following pay-off table :

States of Nature	Courses of Action			
	A1	A2	A3	A4
N1	400	900	900	1000
N2	200	400	700	- 300
N3	600	200	500	700

Identify the optimum course of action under :

- Optimistic criterion (assume that payoff values represent profits) ;
  - Pessimistic criterion ; and
  - Hurwicz criterion  $\alpha = 0.8$ .
31. A The time estimates (in weeks) for the activities of a PERT network are given below :

Activity	$t_0$	$t_m$	$t_p$
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

- Draw the project network.
- Identify all paths through it and write critical path.
- Determine the expected project length and standard deviation.

(2 × 15 = 30 marks)

C 21208

(Pages : 5)

Name.....

Reg. No.....

**FOURTH SEMESTER (CUCBCSS—UG) DEGREE EXAMINATION  
APRIL 2022**

B.B.A.

BBA IVC 04—MANAGEMENT SCIENCE

(2014—2018 Admissions)

Time : Three Hours

Maximum : 80 Marks

**Part I***Answer all questions.**Each question carries 1 mark.*

1. What have been constructed from OR problems and methods for solving the models that are available in many cases ?
  - a) Scientific Models.
  - b) Algorithms.
  - c) Mathematical Models.
  - d) None of the above.
2. Which of the following is not the phase of OR methodology ?
  - a) Formulating a problem.
  - b) Constructing a model.
  - c) Establishing controls.
  - d) Controlling the environment.
3. Feasible solution satisfies :
  - a) Only constraints.
  - b) Only non-negative restriction.
  - c) [a] and [b] both.
  - d) [a], [b] and Optimum solution.
4. Pick up the incorrect statement from the following :
  - a) The activity which consumes maximum time, is called a node.
  - b) The activity is the time consuming part of a project.
  - c) The beginning and end of a job, are called events.
  - d) Logically and sequentially connected activities and events for man at work.

**Turn over**



13. Explain hurwicz alpha criterion.
14. What is Decision Tree ?
15. Explain EOL.
16. What is linear programming problems ?
17. What is feasible solution ?
18. What do you mean by pure strategy ?
19. Explain the term CPM.
20. What is critical activity ?

(8 × 2 = 16 marks)

**Part III**

*Answer any six questions.  
Each question carries 4 marks.*

21. Discuss the important Operation Research techniques.
22. State the uses of network techniques for the management.
23. Discuss some methods which are useful for decision making under uncertainty.
24. Explain (a) Pay-off ; (b) Value of the Game ; and (c) Saddle point.
25. Write a note on : (a) Total float ; (b) Free float ; and (c) Independent float.
26. For a project following time estimates are given. Prepare network and find project duration. Also find variance of the project :

Activity	Preceeding	$t_o$	$t_p$	$t_m$
A	—	2	10	3
B	—	2	4	3
C	A	1	3	2
D	A	4	14	6
E	B	4	12	5
F	C	3	5	4
G	D, E	1	7	1

**Turn over**

27. Use the graphical method to solve the following LP problem :

$$\text{Minimize } Z = 3x_1 + 2x_2$$

subject to the constraints

$$5x_1 + x_2 \geq 10,$$

$$x_1 + x_2 \geq 6,$$

$$x_1 + 4x_2 \geq 12$$

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

28. Determine an initial basic feasible solution to the following transportation problem by using the North-West corner rule, where  $O_i$  and  $D_j$  represent  $i^{\text{th}}$  origin and  $j^{\text{th}}$  destination, respectively :

		Destination				Supply
		$D_1$	$D_2$	$D_3$	$D_4$	
Origin	$O_1$	6	4	1	5	14
	$O_2$	8	9	2	7	16
	$O_3$	4	3	6	2	5
Demand		6	10	15	4	

(6 × 4 = 24 marks)

#### Part IV ( Long Essays)

Answer any **two** questions.

Each question carries 15 marks.

29. A firm makes two products X and Y, and has a total production capacity of 9 tonnes per day. Both X and Y require the same production capacity. The firm has a permanent contract to supply at least 2 tonnes of X and at least 3 tonnes of Y per day to another company. Each tonne of X requires 20 machine hours of production time and each tonne of Y requires 50 machine hours of production time. The daily maximum possible number of machine hours is 360. All of the firm's output can be sold. The profit made is Rs. 80 per tonne of X and Rs. 120 per tonne of Y. Formulate this problem as an LP mode and solve it by using graphical method to determine the production schedule that yields the maximum profit.

30. A project has the following times schedule :

Activity	Times in weeks	Activity	Times in weeks
(1-2)	4	(5-7)	8
(1-3)	1	(6-8)	1
(2-4)	1	(7-8)	2
(3-4)	1	(8-9)	1
(3-5)	6	(8-10)	8
(4-9)	5	(9-10)	7
(5-6)	4		

Construct the network and compute :

- 1  $T_E$  and  $T_L$  for each event.
- 2 Float for each activity.
- 3 Critical path and its duration.

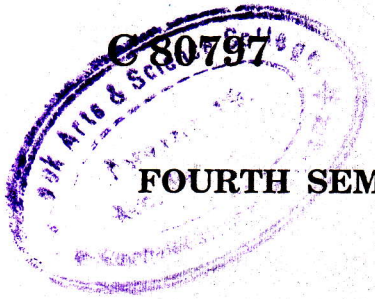
31. The following is a pay-off table :

Action	<i>Event (State of nature)</i>			
	$E_1$	$E_2$	$E_3$	$E_4$
$A_1$	50	300	- 150	50
$A_2$	400	0	100	0
$A_3$	- 50	200	0	100
$A_4$	0	300	300	0

Suppose that the probabilities of the events in this table are  $P(E_1) = 0.15$  ;  $P(E_2) = 0.45$  ;  $P(E_3) = 0.25$  ;  $P(E_4) = 0.15$ .

Calculate the expected pay-off. Prepare the opportunity loss table and calculate the expected loss of each action.

(2 × 15 = 30 marks)



(Pages : 4)

Name.....

Reg. No.....

**FOURTH SEMESTER B.Com./B.B.A. DEGREE EXAMINATION, APRIL 2020**

(CUCBCSS—UG)

B.B.A.

BBA IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 80 Marks

**Part I**

*Answer all questions.*

*Each question carries 1 mark.*

1. The model in which one set of properties is used to represent other set of properties are called \_\_\_\_\_.  
(a) Iconic model. (b) Physical model.  
(c) Analogue model. (d) Mathematical model.
2. If one event happens to be the beginning event of two or more activities, it is defined as \_\_\_\_\_.  
(a) Burst event. (b) Merge event.  
(c) Successor event. (d) Predecessor event.
3. \_\_\_\_\_ is a position in the pay off matrix where the maximum of row minima coincide with the minimum of column maxima.  
(a) Saddle point. (b) Pay-off.  
(c) Strategy. (d) Optimum point.
4. From the following which one is not a transportation problem method :  
(a) North west corner method. (b) Least cost method.  
(c) Hurwics alpha criterion. (d) Vogels approximation method.
5. When a decision maker chooses from among several possible options whose possibilities of occurrence can be stated, he is said to take :  
(a) Decision under risk. (b) Decision under certainty.  
(c) Decision under uncertainty. (d) All the above.
6. Set of rules or alternative course of action available to the player in advance is known as \_\_\_\_\_.  
(a) Pay-off. (b) Value.  
(c) Criterion. (d) Strategy.

**Turn over**

7. A solution which satisfies all the constraints is known as :
- (a) Feasible solution. (b) Optimal solution.  
(c) Linearity. (d) None of the above.
8. That portion of total float that can be used by an activity without delaying any succeeding activity is known as \_\_\_\_\_.
- (a) Independent float. (b) Free float.  
(c) Interfering float. (d) Slack.
9. The maximization or minimization of quantity is the :
- (a) Goal of management science.  
(b) Decision for decision analysis.  
(c) Constraint of operations research.  
(d) Objective of linear programming.
10. Operations research simply helps in improving \_\_\_\_\_ of the solution but does not in a perfect solution
- (a) Quality. (b) Clarity.  
(c) Function. (d) All the above.

(10 × 1 = 10 marks)

### Part II (Short Essay Questions)

*Answer any eight questions.*

*Each question carries 2 marks.*

11. What is Pay-off ?
12. What are the errors in network construction ?
13. What are the advantages of a model ?
14. What are the features of a game ?
15. What is expected value of perfect information ?
16. What is a transportation problem ?
17. What is a dummy activity ?
18. Define LPP.
19. What are the different phases in network techniques.
20. What are the time estimates associated with PERT ?

(8 × 2 = 16 marks)

## Part III

Answer any **six** questions.  
Each question carries 4 marks.

21. Discuss the phases in OR.
22. Explain the rules in the construction of network diagram.
23. What are assumptions of LPP ?
24. Describe the decision making process.
25. What are the choices available to decision maker in situations of uncertainty ?
26. Formulate LPP.

An animal feed Company must produce at least 200 kg of mixture consisting of ingredients  $x_1$  and  $x_2$  daily.  $x_1$  costs Rs. 3 per kg and  $x_2$ . Rs. 8 per kg. No more than 80 kg of  $x_1$  can be used and atleast 60 kg of  $x_2$  must be used.

27. Construct a network diagram :

Activities	Preceding activities
A	—
B	—
C	A
D	A
E	B, c
F	B, c
G	B, c
H	D, E
I	F
J	F
K	G
L	H, I
M	H, I
N	J, K, L

28. A company has factories at  $F_1$ ,  $F_2$  and  $F_3$  which supply warehouses at  $W_1$ ,  $W_2$  and  $W_3$ . Weekly factory capacities are 200,160 and 90 units respectively. Weekly warehouse requirements are 180, 120, and 150 units respectively, unit shipping costs in Rs. are as under :

Factory	Warehouse			Supply
	$W_1$	$W_2$	$W_3$	
$F_1$	16	20	12	200
$F_2$	14	8	18	160
$F_3$	26	24	16	90
Demand	180	120	150	350

Determine the optimum distribution for this company to minimize shipping cost.

(6 × 4 = 24 marks)

Turn over

**Part IV (Long Essays)**

*Answer any two questions.*

*Each question carries 15 marks.*

29. For a project given below find : (a) Expected time for each activity ; (b) EST, EFT, LST, LFT for activities ; (c) Critical path ; (d) Float.

Task	:	A	B	C	D	E	F	G	H	I	J	K
Least time	:	4	5	8	2	4	7	8	4	3	5	6
Greatest time	:	6	9	12	6	10	15	16	8	7	11	12
Most likely time	:	5	7	10	4	7	8	12	6	5	8	9

30. Solve LPP graphically :

$$\text{Maximize } Z = 80X_1 + 120X_2$$

$$\text{subject to } X_1 + X_2 \leq 9$$

$$X_1 \geq 2$$

$$X_2 \geq 3$$

$$20X_1 + 50X_2 \leq 360$$

$$X_1, X_2 \geq 0.$$

31. A super bazar must decide on the level of supplies it must stock to meet the needs of its customers during Diwali days. The exact number of customers is not known, but it is expected to be one of the 4 categories, 300, 350, 400 or 450 customers. Four levels of supplies are thus suggested with level  $j$  being ideal (from the view point of incurred costs) if the number of customers falls in category  $j$ . Deviations from the ideal level results in additional costs either because extra supplies stocked needlessly or because demand cannot be satisfied. The table below provides these costs in thousands of rupee :

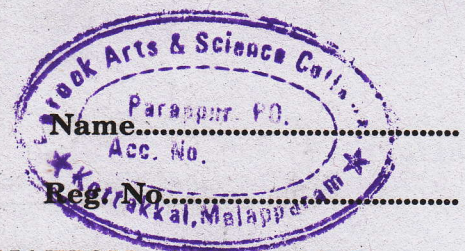
Customer category	Supplies level			
	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	A <sub>4</sub>
E <sub>1</sub>	7	12	20	27
E <sub>2</sub>	10	9	10	25
E <sub>3</sub>	23	20	14	23
E <sub>4</sub>	32	24	21	17

Apply Laplace principle

(2 × 15 = 30 marks)

C 61165

(Pages : 4)



**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, APRIL 2019**

(CUCBCSS—UG)

B.B.A.

BBA IV C 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 80 Marks

**Part I**

*Answer all ten questions.*

*Each question carries 1 mark.*

1. Decision variables are :
  - (a) Controllable.
  - (b) Uncontrollable.
  - (c) Parameters.
  - (d) None of the above.
2. The application of OR techniques involves \_\_\_\_\_ approach.
  - (a) Individual.
  - (b) Team.
  - (c) Critical.
  - (d) None of the above.
3. \_\_\_\_\_ is a method of analyzing the current movement of the same variable in an effort to predict the future movement of the same variable.
  - (a) Goal programming.
  - (b) Markov analysis.
  - (c) Replacement theory.
  - (d) Queuing theory.
4. A constraint in an LP model restricts :
  - (a) Value of objective function.
  - (b) Value of decision variable.
  - (c) Use of available resource.
  - (d) All of the above.
5. A linear programming model does not contain which of the following components ?
  - (a) Data.
  - (b) Decisions.
  - (c) Constraints.
  - (d) A spread sheet.
6. \_\_\_\_\_ is a series of related activities which result in some product or services.
  - (a) Network.
  - (b) Transportation model.
  - (c) Assignment.
  - (d) None of these.

**Turn over**

7. PERT emphasis on \_\_\_\_\_.
- (a) Time. (b) Activity.  
(c) (a) and (b). (d) None of the above.
8. For decision-making under uncertainty, identify the decision rule that is appropriate for the optimist:
- (a) Laplace. (b) Maximax.  
(c) Minimax regret. (d) Maxmin.
9. The minimum expected opportunity loss is :
- (a) Equal to EVPI. (b) Minimum regret.  
(c) Equal to EMV. (d) Both (a) and (b).
10. Game theory models are classified by the :
- (a) Number of players. (b) Sum of all payoff.  
(c) Number of strategies. (d) All of the above.

(10 × 1 = 10 marks)

**Part II (Short Answer Questions)**

*Answer any eight questions.  
Each question carries 2 marks.*

11. What are the characteristics of Operations research technique ?
12. Distinguish between iconic model and analogue model.
13. What are the main properties of linear programming problems ?
14. Define a dummy activity.
15. Define critical path method.
16. Define Programme Evaluation and Review Technique.
17. What are the limitations of PERT /CPM ?
18. Define pay-off.
19. Define Expected Monetary Value (EMV).
20. What is meant by a decision tree ?

(8 × 2 = 16 marks)

**Part III (Short Essays)**

*Answer any six questions.  
Each question carries 4 marks.*

21. Define Operations Research and discuss its scope and limitations.
22. A paint manufacturer produces two types of paint, one type of standard quality (S) and the other of top quality (T). To make these paints, he needs two ingredients, the pigment and the resin. Standard quality paint requires 2 units of pigment and 3 units of resin for each unit made, and is sold at a profit of R1 per unit. Top quality paint requires 4 units of pigment and 2 units of resin for each unit made, and is sold at a profit of R1.50 per unit. He has stocks of 12 units of pigment, and 10 units of resin. Formulate the above problem as a linear programming problem to maximize his profit?
23. Construct the network diagram for a project with the following activities :

<i>Activity</i>	<i>Description</i>	<i>Predecessor activity</i>
A	Finish Component Development	
B	Design marketing programme	A
C	Design production system	A
D	Select Advertising media	B
E	Initial production run	C
F	Release component to market	D, E

24. Solve the game with the following pay-off matrix :

	Player B					
	Strategies					
	I	II	III	IV	V	
Player A Strategies	1	2	3	8	7	0
	2	1	7	5	2	3
	3	4	2	3	5	1
	4	6	4	5	4	7

25. By using the North West Corner Method determine the basic feasible solution :

Factories	Retail Agency					Capacity
	1	2	3	4	5	
1	1	9	13	36	51	50
2	24	12	16	20	1	100
3	14	33	1	23	26	150
Requirement	100	60	50	50	40	300

**Turn over**

26. What is decision-making under risk and explain different methods to solve it ?
27. Describe MODI method to solve the Transportation problem.
28. What are the different techniques involved in Operations Research ?

(6 × 4 = 24 marks)

**Part IV (Long Essays)***Answer any two questions.**Each question carries 15 marks.*

29. Solve graphically the following LPP

$$\text{Maximize } Z = 40X_1 + 80X_2$$

subject to :

$$2X_1 + 3X_2 \leq 48$$

$$X_1 \leq 15$$

$$X_2 \leq 10$$

$$X_1 \geq 0, X_2 \geq 0.$$

30. Find the optimum solution of the following TP :

	Supply					
	1	9	13	36	51	50
	24	12	16	20	1	100
	14	33	1	23	26	150
Demand	100	70	50	40	40	300

31. For the past 200 days, the sales of cakes (1 kg) from the Lovely Bakery has been as follows :

Daily sales : 0 100 200 300 400

No. of days : 10 60 60 50 20

- (a) Calculate the expected sale of cakes.
- (b) Production cost per cake (1 kg) are Rs. 5 and sale price is Rs. 10 per cake, and any cake unsold at the end of the day is contracted to a local farmer, who pays Rs. 2 per cake. Draw up a pay-off table for each sales/production combination.
- (c) Compute the expected profit arising from each level of production and determine the optimal policy.

(2 × 15 = 30 marks)

**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, APRIL 2018**

(CUCBCSS—UG)

BBA IV C 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 80 Marks

**Part I**

*Answer all ten questions.  
Each question carries 1 mark.*

1. OR provides solution only if the elements are :
  - (a) Quantified.
  - (b) Qualified.
  - (c) Feasible.
  - (d) Optimal.
2. The best use of linear programming technique is to find an optimal use of :
  - (a) Money.
  - (b) Man power.
  - (c) Machine.
  - (d) All of the above.
3. In linear programming problem if all constraints are less than or equal to, then the feasible region is :
  - (a) Above lines.
  - (b) Below the lines.
  - (c) Unbounded.
  - (d) None of the above.
4. Any activity which does not consume either any resource or time is called \_\_\_\_\_ activity.
  - (a) Predecessor.
  - (b) Successor.
  - (c) Dummy.
  - (d) End.
5. An event which represents the beginning of more than one activity is known as \_\_\_\_\_ event.
  - (a) Merge.
  - (b) Net.
  - (c) Burst.
  - (d) None of the above..
6. While solving an LP problem, infeasibility may be removed by :
  - (a) Adding another constraint.
  - (b) Adding another variable.
  - (c) Removing a constraint.
  - (d) Removing a variable.
7. \_\_\_\_\_ is the duration by which an activity can be delayed without delaying the project
  - (a) Slack.
  - (b) Total float.
  - (c) Free float.
  - (d) Independent float.

**Turn over**

8. If a decision theory problem has 3 decision alternatives and 4 states of nature, the number of payoffs in that problem will be :
- (a) 3. (b) 4.  
(c) 12. (d) 64.
9. While using Hurwicz criterion, the coefficient of realism ?
- (a) Represents the degree of optimism.  
(b) Represents the degree of pessimism.  
(c) Is the probability of state of nature.  
(d) None of the above.
10. When total supply is equal to total demand in a transportation problem, the problem is ?
- (a) Balanced. (b) Unbalanced.  
(c) Degenerate. (d) None of the above.

(10 × 1 = 10 marks)

### Part II (Short Answer Questions)

*Answer any eight questions.  
Each question carries 2 marks.*

11. Define Operations Research.
12. Define waiting line model or queueing model.
13. Where we use linear programming ?
14. Give two applications of linear programming ?
15. What is main objective of network analysis ?
16. What are the main network techniques ?
17. Define Pessimism (maximin or Minimax) criterion.
18. Define game theory ?
19. Give three methods used to find out initial feasible solution of a transportation problem ?
20. Define transportation problem ?

(8 × 2 = 16 marks)

### Part III (Short Essays)

*Answer any six questions.  
Each question carries 4 marks.*

21. Explain the different operations research models.

22. A Post office requires different numbers of employees on different days of the week. Union rules state each employee must work 5 consecutive days and then receive two days off.

	<i>Mon.</i>	<i>Tue.</i>	<i>Wed.</i>	<i>Thur.</i>	<i>Fri.</i>	<i>Sat.</i>	<i>Sun.</i>
Staff Needed :	17	13	15	19	14	16	11

Formulate the problem as a linear programming problem to find the minimum number of employees needed.

23. Draw a network diagram from the following activities :

Activity :	1 - 2	1 - 3	1 - 4	2 - 5	3 - 5	4 - 6	5 - 6
Time deviation :	2	4	3	1	6	5	7

24. A grocery receives its weekly supply of eggs every Thursday morning. This shipment just last until the following Thursday when a new shipment is received. Any eggs left unsold by Thursday are destroyed. Egg sell for \$10 per hundred and cost \$8 per hundred. The weekly demand for eggs at this grocery varies from week to week. From past experience, the following probability distribution is assigned to weekly demand :

Demand (hundreds of eggs) :	10	11	12	13	14
Probability :	0.1	0.2	0.4	0.2	0.1

This pattern of demand remains stable throughout the year and the demand for eggs is not seasonal, and the trend is flat. How many eggs should be ordered for delivery every Thursday ?

25. For the following transportation problem, obtain initial feasible solution by Vogel's Approximation method :

<i>Origin</i>	<i>Destination</i>				<i>Availability</i>
	1	2	3	4	
1	10	8	11	7	20
2	9	12	14	6	40
3	8	9	12	10	35
<i>Requirement</i>	16	18	31	30	95

26. Explain different criteria of decision making under uncertainty ?
27. A television dealer finds that the cost of a TV in stock for a week is Rs. 30 and the cost of a unit shortage is Rs. 70. For one particular model of television the probability distribution of weekly sales is as follows :

Weekly Sales :	0	1	2	3	4	5	6
Probability :	0.10	0.10	0.20	0.25	0.15	0.15	0.05

How many units per week should the dealer order ? Also, find EVPI ?

28. Explain decision tree ?

(6 × 4 = 24 marks)

Turn over

### Part IV (Long Essays)

Answer any two questions.  
Each question carries 15 marks.

29. Solve graphically the following LPP :

$$\text{Maximize } Z = 3X_1 + 2X_2$$

Subject to the constraints :

$$2X_1 + X_2 \leq 1$$

$$X_1 \leq 2$$

$$X_1 + X_2 \leq 3$$

$$X_1, X_2 \geq 0.$$

30. Find the Optimum solution to the following TP :

Origin	Destination			Availability
	A	B	C	
1	50	30	220	1
2	90	45	170	3
3	250	200	50	4
Requirement	4	2	2	

31. A small maintenance project consists of the following Jobs whose precedence relationships are gives below :

Job	:	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration	:	15	15	3	5	8	12	1	14	3	14
		(days)									

- (1) Draw an arrow diagram.
- (2) Find the total float for each activity.
- (3) Find the critical path and the project duration.

(2 × 15 = 30 marks)

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Name.....

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**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, APRIL 2017**

(CUCBCSS-UG)

Complementary Course

BBA IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 80 Marks

**Part I**

*Answer all ten questions.*

1. Operations research approach is :

- (a) Multi disciplinary.
- (b) Scientific.
- (c) Intuitive.
- (d) All of the above.

2. A model is :

- (a) A representation of reality.
- (b) An approximation.
- (c) An idealization'.
- (d) All of the above.

3. Linear programming is a :

- (a) Constrained optimization technique.
- (b) Technique for economic allocation of limited resources.
- (c) Mathematical technique.
- (d) All of the above.

4. A feasible solution to a linear programming problem :

- (a) Must satisfy all problem constraints simultaneously.
- (b) Need not satisfy all constraints.
- (c) Must be a corner point of the feasible region.
- (d) Must optimize the value of the objective function..

5. Decision theory is concerned with :

- (a) Methods of arriving at an optimal decision.
- (b) Selecting optimal decision in sequential manner.
- (c) Analysis of information that is available.
- (d) All of the above.

**Turn over**

6. PERT gives emphasis on :
- (a) Time. (b) Activity.  
(c) Time and Activity. (d) None of the above.
7. When total supply is equal to total demand in a transportation problem, the problem is said to be ?
- (a) Balanced. (b) Unbalanced.  
(c) Degenerate. (d) None of the above.
8. Game theory models are classified by the :
- (a) Number of players. (b) Sum of all pay off.  
(c) Number of strategies. (d) All of the above.
9. The minimum expected opportunity loss is :
- (a) Equal to EVPI. (b) Minimum regret.  
(c) Equal to EMV. (d) Both (a) and (b).
10. An assignment problem can be solved by
- (a) Simplex method.  
(b) Transportation method.  
(c) Both simplex & transportation method.  
(d) None of the above.

(10 × 1 = 10 marks)

**Part II (Short Answer Questions)**

*Answer any eight questions.*

11. Define Operations Research.
12. What do you mean by a model ?
13. State the objectives of Operations Research.
14. Define linear programming.
15. Define constraints.
16. What is PERT ?
17. What do you mean by a strategy ?
18. What do you mean by a dummy activity ?
19. Define a basic feasible solution to LPP.
20. What do you mean by expected monetary value ?

(8 × 2 = 16 marks)

### Part III (Short Essays)

Answer any six questions.

21. Discuss scientific methodology used in operations research.
22. Explain the different types of models used in operations research.
23. What do you mean by decision making under risk ? What are the methods used for decision making under this situation ?
24. Distinguish between PERT and CPM.
25. A person wants to decide the constituents of a diet which will fulfill his daily requirements of proteins, fats and carbohydrates at the minimum cost. The choice is to be made from four different types of foods. The yields per unit of these foods are given in the following table Formulate linear programming model for the problem :

Food type	Yield per unit			Cost per unit (Rs.)
	Proteins	Fats	Carbohydrates	
1	3	2	6	45
2	4	2	4	40
3	8	7	7	85
4	6	5	4	65
Minimum requirement	800	200	700	

26. From the following pay off matrix determine the best course of action on the basis of Expected monetary value :

States of nature	Action A	Action B	Action C
$S_1$	250	-100	-800
$S_2$	400	480	520
$S_3$	620	800	860

Probabilities associated with the states of natures  $S_1$ ,  $S_2$  and  $S_3$  are 0.1, 0.7 and 0.2 respectively.

27. From the following pay off matrix of two competing firms Alpha and Beta. determine the optimal strategy for both the firms and value of the game under maximin and minmax principle :

		Firm Alpha				
		4	-1	2	6	7
Firm Beta	-1	8	1	4	12	
	12	5	3	14	10	
	1	10	2	2	-1	

Turn over

28. From the following opportunity loss table determine best decision strategy :

States of Nature	Action I	Action II	Action III
X	4	-2	6
Y	2	4	5
Z	2	4	-4

States of natures S1, S2 and S3 assume probabilities 0.3, 0.3 and 0.4 respectively.

(6 × 4 = 24 marks)

#### Part IV (Long Essay)

Answer any two questions.

29. A pharmaceutical company manufactures two types of drugs, X and Y. Each unit of drug Y takes twice as long to produce as one unit of X and the company would have time to make a maximum of 2000 units per day if it produced drug X only. The supply of raw material is sufficient to produce both X and Y is only 1500 units. Drug Y requires a chemical compound which is available for the production of 600 units per day. If the company makes a profit of rupees 3 and 5 per unit respectively on X and Y, how many of each drug should be produced to maximize profit, using graphical method of LPP.
30. A company has four terminals U, V, W and X. at the start of a particular day 10, 4, 6, and 5 trailers respectively are available at these terminals. During the previous night 13, 10, 6 and 6 trailers respectively were loaded at plants A, B, C and D. The company dispatcher has come up with the costs between the terminals and plants as follows :

		Plants			
		A	B	C	D
Terminals	U	20	36	10	28
	V	40	20	45	20
	W	75	35	45	50
	X	30	35	40	25

Find the allocation of loaded trailers from plants to terminals in order to minimize transportation cost.

31. Construct a network diagram and find critical path in respect of a project which has the following characteristics :

Activity	1-2	2-3	3-4	3-5	4-6	5-6	5-7	6-8	7-8	8-9	9-10
Duration	13	8	10	11	9	10	6	8	7	14	18

(2 × 15 = 30 marks)

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Name.....

Reg. No.....

**FOURTH SEMESTER B.B.A. DEGREE (SUPPLEMENTARY) EXAMINATION**  
**APRIL 2017**

(UG-CCSS)

Complementary Course

BB IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 30 Weightage

**Part A**

*This part contains three bunches of questions carrying equal weightage of 1.  
Each bunch has four questions.  
Answer all twelve questions.*

(A) Choose the correct answer from the bracket :

1 A model is \_\_\_\_\_.

- (a) An essence of reality.                      (b) An approximation.  
(c) An idealization.                              (d) All of the above.

2 A constraint in an L P model represents :

- (a) Limitations.  
(b) Requirements.  
(c) Balancing limitation and requirements.  
(d) All of the above.

3 The number of non-negative variables in a basic feasible solution to an  $m \times n$  transportation problem is :

- (a)  $mn$ .    (b)  $m + n$ .  
(c)  $m + n + 1$ .                                      (d)  $m + n - 1$ .

4 The minimum expected opportunity loss (EOL) is :

- (a) Equal to EVPI.                                      (b) Minimum regret.  
(c) Equal to EMV.                                      (d) Both (a) and (b).

Turn over

(B) Fill in the blanks :

- 5 Games which involves more than 2 players are called \_\_\_\_\_.
- 6 When the sum of gains of one player is equal to the sum of losses to another players in a game, this situation is known as \_\_\_\_\_.
- 7 The objective of network analysis is \_\_\_\_\_.
- 8 Total float = \_\_\_\_\_.

(C) Answer in *one sentence* :

- 9 What is optimum Basis Feasible solution ?
- 10 What is degeneracy problem in transportation ?
- 11 State maximin theorem.
- 12 What is saddle point ?

(12 × ¼ = 3 weightage)

### Part B

*Answer all nine questions in one or two sentences.  
Each question carries a weight of 1.*

- 13 What is meant by linear programming problem ?
- 14 What is operations research ?
- 15 State any *four* applications of Operations Research.
- 16 What are the limitations of LPP ?
- 17 State the transportation problem as a special case LPP.
- 18 Define *two* persons zero sum game.
- 19 What is critical path ?
- 20 Write any *four* assumptions of a game theory.
- 21 Explain the term dummy activity.

(9 × 1 = 9 weightage)

### Part C

*Answer any five questions.  
Answer not to exceed one page each.  
Each question carries a weight of 2.*

- 22 Explain Vogels method of transportation problem.
- 23 Discuss in brief about the importance of OR models.

24 Solve the following LPP by graphical method

$$\text{Maximize} = 40x_1 + 60x_2$$

subject to the constraints :

$$x_1 + x_2 \leq 18$$

$$x_1 \leq 4, x_2 \leq 6, 10x_1 + 25x_2 \leq 180, x_1, x_2 \geq 0.$$

25 Explain the Game theory without saddle points and using mixed strategies.

26 Explain maximin, minimax Principle in decision theory.

27 Determine an initial feasible solution to the following transportation problem using north west corner rule.

		To					available
From	3	4	6	8	9	20	
	2	10	1	5	8	30	
	7	11	20	40	3	15	
	2	1	9	14	16	13	
Demand	40	6	8	18	6		

28 Draw the network diagram for the project whose activities and their precedence relationship are given below :

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

(5 × 2 = 10 weightage)

### Part D

Answer any two questions.

Each question carries a weight of 4.

29 Discuss the importance of Operations Research in decision-making process.

30 A small project is composed of 7 activities whose time estimates are giving below :

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic time	1	1	2	1	2	2	3
Most likely time	1	4	2	1	5	5	6
Pessimistic time	7	7	8	1	14	8	15

(a) Draw the network diagram and identify the path.

(b) Expected length of the project.

Turn over

- 31 For the following pay-off matrix of firm A, determine the optima strategies for the firms and value of the game :

		Firm B				
		3	-1	4	6	7
Firm A	(	-1	8	2	4	12
	16	8	6	4	12	
	1	11	-4	2	1	
	)					

(2 × 4 = 8 weightage)

**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, APRIL 2016**

(CUCBCSS—UG)

Complementary Course

BBA IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 80 Marks

**Part I***Answer all ten questions.**Each question carries 1 mark.*

1. Operations research can be applied to :
  - (a) Military.
  - (b) Business.
  - (c) Administration.
  - (d) All of the above.
2. An optimization model :
  - (a) Mathematically provides best decision.
  - (b) Provides decision with limited context.
  - (c) Helps in evaluating various alternatives constantly.
  - (d) All of the above.
3. A constraint in an LP model restricts :
  - (a) Value of objective function.
  - (b) Value of decision variable.
  - (c) Use of available resource.
  - (d) All of the above.
4. All negative constraints must be written as :
  - (a) Equality.
  - (b) Non-equality.
  - (c) Greater than or equal to.
  - (d) Less than or equal to.
5. Any activity which does not consume either any resource or time is a :
  - (a) Predecessor.
  - (b) Successor.
  - (c) Dummy.
  - (d) End.
6. The solution to a transportation problem with  $m$ -rows and  $n$ -columns is feasible if numbers of positive allocations are :
  - (a)  $m + n$ .
  - (b)  $m + n - 1$ .
  - (c)  $m \times n$ .
  - (d)  $m + n + 1$ .

**Turn over**

7. Game theory is the study of :
- (a) Selecting optimal strategies. (b) Resolving conflict between players.  
(c) Both (a) and (b). (d) None of the above.
8. The sequence of activities which determines the total project time is :
- (a) Network. (b) Critical Path.  
(c) Critical activities. (d) None of the above.
9. Which of the following might be viewed as an optimistic decision criterion ?
- (a) Hurwitz criterion. (b) Maximin.  
(c) Maximax. (d) Minimax.
10. Game theory models are classified by :
- (a) Number of players. (b) Sum of all pay-off.  
(c) Number of strategies. (d) All of the above.

(10 × 1 = 10 marks)

### Part II (Short Answer Questions)

Answer any **eight** questions.

11. What do you mean by physical model ?
12. Define linear programming.
13. Define risk.
14. What do you mean by value of the game ?
15. What do you mean by pure strategy ?
16. What is expected opportunity loss ?
17. What do you mean by loop in transportation problems ?
18. What is float ?
19. What is critical path ?
20. What is degeneracy in transportation problems ?

(8 × 2 = 16 marks)

### Part III (Short Essays)

Answer any **six** questions.

21. List out the various phases in operation research approach to problem solving.
22. What do you mean by a model ? What are its unique characteristics ?

23. Discuss the significance of linear programming problems.
24. What do you mean by decision-making ? Explain various decision-making situations.
25. What do you mean by network analysis ? State its objectives.
26. From the following opportunity loss table determine the best decision strategy :

<i>States of Nature</i>	<i>Action I</i>	<i>Action II</i>	<i>Action III</i>
S1	2.0	2.5	3.0
S2	2.0	2.4	2.2
S3	2.6	2.8	3.0

States of natures S1, S2 and S3 assume probabilities 0.4, 0.4 and 0.2 respectively.

27. The XYZ Company during the festival season combines two factors A and B to form a gift pack which must weigh 5 kg. At least 2 kg of A and not more than 4 kg of B should be used. The net profit contribution to the company is Rs. 5 per kg for A and Rs. 6 per kg for B. Formulate LP model to find the optimal factor mix.
28. From the following pay-off matrix of two firms X and Y , determine the optimal strategy for both the firms and value of the game under maximin and minmax principle :

		<i>Firm Y</i>				
		3	-1	4	6	7
<i>Firm X</i>	-1	-1	8	2	4	12
	16	16	8	6	14	12
	1	1	11	-4	2	1

(4 × 6 = 24 marks)

**Turn over**

### Part IV (Long Essays)

Answer any two questions.

29. Solve the following linear programming problem graphically :

$$\begin{aligned} \text{Maximize } Z &= 2x_1 + x_2 \\ \text{subject to } x_1 + 2x_2 &\leq 10 \\ x_1 + x_2 &\leq 6 \\ x_1 - x_2 &\leq 2 \\ x_1 - 2x_2 &\leq 1 \\ x_1, x_2 &\geq 0. \end{aligned}$$

30. Find the optimum solution to the following transportation problem in which the cells contain the transportation cost in rupees :

	W1	W2	W3	W4	W5	Available
F1	7	6	4	5	9	40
F2	8	5	6	7	8	30
F3	6	8	9	6	5	20
F4	5	7	7	8	6	10
Required	30	30	15	20	5	100

31. From the following data construct a network diagram and determine critical path :

Activity ...	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Duration ...	4	1	1	1	6	5	4	8	1	2	5	7

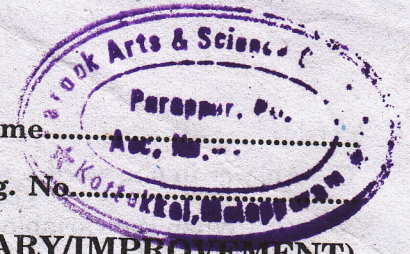
(2 × 15 = 30 marks)

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Name.....

Reg. No.....



**FOURTH SEMESTER B.B.A. DEGREE (SUPPLEMENTARY/IMPROVEMENT)  
EXAMINATION, MAY 2016**

(UG-CCSS)

Complementary Course

BB IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 30 Weightage

**Part A**

*This part consists of three bunches of questions carrying equal weightage.  
Each bunch has 4 questions.*

**A. Fill in the blanks :**

- 1 \_\_\_\_\_ theory is used to determine the optimum strategy in a competitive situation.
- 2 \_\_\_\_\_ off table represents the economics of a problem.
- 3 \_\_\_\_\_ are the outcomes, the occurrence of which affect the achievement of the objectives.
- 4 If the player select the some strategy each time, it is called \_\_\_\_\_ strategy.

**B. Choose the correct answer :**

5 It is a technique of Operations Research :

- |          |          |
|----------|----------|
| (a) IRR. | (b) NPV. |
| (c) PBP. | (d) CPM. |

6 The beginning of a network diagram is denoted by :

- |                     |                        |
|---------------------|------------------------|
| (a) Starting node.  | (b) Starting activity. |
| (c) Starting arrow. | (d) None of these.     |

7 The path which takes the maximum time is called :

- |                    |                        |
|--------------------|------------------------|
| (a) Slack.         | (b) Float.             |
| (c) Critical path. | (d) Non-critical path. |

8 Vogel's approximation method is used for solving :

- |                             |
|-----------------------------|
| (a) Transportation problem. |
| (b) Scheduling problem.     |
| (c) L.P.P.                  |
| (d) None of these.          |

**Turn over**

C. Answer in one word :

- 9 When the variables and their relationships can be defined precisely, the model is said to be :
- 10 The quantitative measurement of achievement as a definite gain or profit that a player hopes to achieve at the end of the game is called :
- 11 Slack is associated with :
- 12 Each activity of a network diagram must have proceeding and succeeding :

(12 × ¼ = 3 weightage)

**Part B**

*Answer all nine questions in one or two sentences each.*

*Each question carries a weightage of 1.*

- 13 Define Operations Research.
- 14 What do you mean by model ?
- 15 What are Constraints ?
- 16 What are feasible solutions ?
- 17 Define Critical path.
- 18 What is a network diagram ?
- 19 What do you mean by Float ?
- 20 What is a decision tree ?
- 21 What is meant by Expected value of perfect information ?

(9 × 1 = 9 weightage)

**Part C**

*Answer any five questions.*

*Each question carries 2 weightage.*

- 22 Discuss the scope of Operations Research.
- 23 Explain the applications of linear programming.
- 24 Define and distinguish between PERT and CPM.
- 25 A manufacturer of furniture makes two products, chairs and tables. Processing of these products is done on the machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours machine A and no time on machine B. There are 160 hours of time per week available an machine A and 300 hours on machine B. Profit gained by the manufacturer from chair and table is Rs. 100 and Rs. 500 respectively. Formulate the problem into a L.P.P. in order to maximise the total profit.

- 26 From the pay-off table shown below, decide which is the optimal act :

Events	Strategies		
	$A_1$	$A_2$	$A_3$
$S_1$	20	40	60
$S_2$	15	- 10	- 15
$S_3$	35	25	- 20

Probability of ( $S_1$ ) = .4       $S_2$  = .5       $S_3$  = .1

- 27 A company has a sales force of 25 men who work out from three Regional Offices. The company produces four basic product lines of hand tools. Mr. Ram, Sales Manager, feels that 6 salesmen are needed to distribute time 1, 10 salesmen to distribute product line 2, 4 salesmen to product line 3 and 5 salesmen to productline 4. The cost is (Rs.) per day of assigning salesmen from each office for selling each of the product lines are as follows :

Regional Office	Product line			
	1	2	3	4
A	21	21	16	18
B	17	28	14	16
C	29	23	19	20

At present 10 Salesmen are allowed to office A, 9 Salesmen to office B and 7 Salesmen to office C. How many Salesmen should be assigned from each office to selling each product line in order to minimise cost ?

- 28 The following table lists the jobs of a network along with their time estimates :

Jobs ( $i - J$ )	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
Time optimistic	3	2	6	2	5	3	3	1	4
Most likely	6	5	12	5	11	6	9	4	19
Pessimistic	15	14	30	8	17	15	27	7	18

Draw the project network and determine the critical path.

(5 × 2 = 10 weightage)

Turn over

## Part D

Answer any two questions.  
Each question carries a weightage of 4.

- 29 Explain the import functions and scope of OR in business.  
30 Find the maximum value of  $Z = 50 X_1 + 70 X_2$

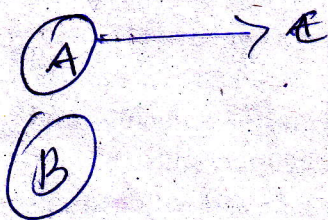
subject to constraints  $X_1 + X_2 \leq 4$   
 $3X_1 + 8X_2 \leq 24$   
 $10X_1 + 7X_2 \leq 35$   
 $X_1, X_2 \geq 0.$

- 31 A small project is made up of the following activities whose precedence relationship is given below :

Activities	Preceding activity	Duration days
A	None	5
B	None	8
C	A	6
D	A	5
E	B, C	10
F	D	6
G	E	4
H	F, G	3
I	E	2
J	H, I	5

Draw the arrow diagram. Find the critical path and total project duration. Also find total and free float.

(2 × 4 = 8 weightage)



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Name.....

Reg. No.....

**FOURTH SEMESTER B.B.A. DEGREE (SUPPLEMENTARY/IMPROVEMENT)  
EXAMINATION, MAY 2016**

(UG-CCSS)

Complementary Course

BB IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 30 Weightage

**Part A**

*This part consists of three bunches of questions carrying equal weightage.  
Each bunch has 4 questions.*

**A. Fill in the blanks :**

- 1 \_\_\_\_\_ theory is used to determine the optimum strategy in a competitive situation.
- 2 \_\_\_\_\_ off table represents the economics of a problem.
- 3 \_\_\_\_\_ are the outcomes, the occurrence of which affect the achievement of the objectives.
- 4 If the player select the some strategy each time, it is called \_\_\_\_\_ strategy.

**B. Choose the correct answer :**

- 5 It is a technique of Operations Research :
  - (a) IRR.
  - (b) NPV.
  - (c) PBP.
  - (d) CPM.
- 6 The beginning of a network diagram is denoted by :
  - (a) Starting node.
  - (b) Starting activity.
  - (c) Starting arrow.
  - (d) None of these.
- 7 The path which takes the maximum time is called :
  - (a) Slack.
  - (b) Float.
  - (c) Critical path.
  - (d) Non-critical path.
- 8 Vogel's approximation method is used for solving :
  - (a) Transportation problem.
  - (b) Scheduling problem.
  - (c) L.P.P.
  - (d) None of these.

**Turn over**

## C. Answer in one word :

- 9 When the variables and their relationships can be defined precisely, the model is said to be :
- 10 The quantitative measurement of achievement as a definite gain or profit that a player hopes to achieve at the end of the game is called :
- 11 Slack is associated with :
- 12 Each activity of a network diagram must have preceding and succeeding :

(12 × ¼ = 3 weightage)

**Part B***Answer all nine questions in one or two sentences each.**Each question carries a weightage of 1.*

- 13 Define Operations Research.
- 14 What do you mean by model ?
- 15 What are Constraints ?
- 16 What are feasible solutions ?
- 17 Define Critical path.
- 18 What is a network diagram ?
- 19 What do you mean by Float ?
- 20 What is a decision tree ?
- 21 What is meant by Expected value of perfect information ?

(9 × 1 = 9 weightage)

**Part C***Answer any five questions.**Each question carries 2 weightage.*

- 22 Discuss the scope of Operations Research.
- 23 Explain the applications of linear programming.
- 24 Define and distinguish between PERT and CPM.
- 25 A manufacturer of furniture makes two products, chairs and tables. Processing of these products is done on the machines A and B. A chair requires 2 hours on machine A and 6 hours on machine B. A table requires 5 hours machine A and no time on machine B. There are 160 hours of time per week available an machine A and 300 hours on machine B. Profit gained by the manufacturer from chair and table is Rs. 100 and Rs. 500 respectively. Formulate the problem into a L.P.P. in order to maximise the total profit.

- 26 From the pay-off table shown below, decide which is the optimal act :

Events	Strategies		
	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>
S <sub>1</sub>	20	40	60
S <sub>2</sub>	15	- 10	- 15
S <sub>3</sub>	35	25	- 20

Probability of (S<sub>1</sub>) = .4      S<sub>2</sub> = .5      S<sub>3</sub> = .1

- 27 A company has a sales force of 25 men who work out from three Regional Offices. The company produces four basic product lines of hand tools. Mr. Ram, Sales Manager, feels that 6 salesmen are needed to distribute time 1, 10 salesmen to distribute product line 2, 4 salesmen to product line 3 and 5 salesmen to productline 4. The cost is (Rs.) per day of assigning salesmen from each office for selling each of the product lines are as follows :

Regional Office	Product line			
	1	2	3	4
A	21	21	16	18
B	17	28	14	16
C	29	23	19	20

At present 10 Salesmen are allowed to office A, 9 Salesmen to office B and 7 Salesmen to office C. How many Salesmen should be assigned from each office to selling each product line in order to minimise cost ?

- 28 The following table lists the jobs of a network along with their time estimates :

Jobs (i - J)	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
Time optimistic	3	2	6	2	5	3	3	1	4
Most likely	6	5	12	5	11	6	9	4	19
Pessimistic	15	14	30	8	17	15	27	7	18

Draw the project network and determine the critical path.

(5 × 2 = 10 weightage)

Turn over

**Part D**

*Answer any two questions.  
Each question carries a weightage of 4.*

- 29 Explain the import functions and scope of OR in business.  
30 Find the maximum value of  $Z = 50 X_1 + 70 X_2$

subject to constraints

$$\begin{aligned} X_1 + X_2 &\leq 4 \\ 3X_1 + 8X_2 &\leq 24 \\ 10X_1 + 7X_2 &\leq 35 \\ X_1, X_2 &\geq 0. \end{aligned}$$

- 31 A small project is made up of the following activities whose precedence relationship is given below :

Activities	Preceding activity	Duration days
A	None	5
B	None	8
C	A	6
D	A	5
E	B, C	10
F	D	6
G	E	4
H	F, G	3
I	E	2
J	H, I	5

Draw the arrow diagram. Find the critical path and total project duration. Also find total and free float.

(2 × 4 = 8 weightage)

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**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, APRIL/MAY 2015**

(U.G.—CCSS)

Complementary Course

BB IVC 04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 30 Weightage

**Part A**

*This part contains three bunches of questions carrying equal weightage of 1.  
Each bunch has four questions. Answer all twelve questions.*

A. Choose the correct answer from the bracket :

1 Decision variables are \_\_\_\_\_.

(a) Controllable.

(b) Uncontrollable.

(c) Parameters.

(d) None of the above.

2 Graphical method of LP problem uses :

(a) Objective function equation.

(b) Constraint equations.

(c) Linear equation.

(d) All of the above.

3 The number of non-negative variable is a basic feasible solution to an  $m \times n$  transportation problems is :

(a)  $mn$ .

(b)  $m + n + 1$ .

(c)  $m + n - 1$ .

(d)  $m + n$ .

4 Which of the following criteria is not applicable to decision making under risk ?

(a) Maximin.

(b) Maxima.

(c) Minimax.

(d) Minimize the expected loss.

B. Fill in the blanks :

5 \_\_\_\_\_ is usually represented by a number with which the course of action is associated.

6 \_\_\_\_\_ is an example of a deterministic model.

7 The objective of network analysis is \_\_\_\_\_.

8 The sequence of critical activities in a network is called \_\_\_\_\_.

C. Answer in one sentence :

9 What is unbounded solution ?

10 What is optimum solution of a transportation problem ?

**Turn over**

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- 11 State minimax theorem.
- 12 What is independent float ?

(12 × ¼ = 3 weightage)

### Part B

*Answer all **nine** questions in one or two sentences.  
Each question carries a weightage of 1.*

- 13 What is an analogue model ?
- 14 State any four applications of operations research.
- 15 What are the limitations of LPP ?
- 16 Define surplus variable with an example.
- 17 What is a transportation problem ?
- 18 Define decision tree.
- 19 State major limitation of game theory.
- 20 What is a dummy activity and when it is needed ?
- 21 What is float ?

(9 × 1 = 9 weightage)

### Part C

*Answer any **five** questions.  
Answer not to exceed **one** page each.  
Each question carries weightage of 2.*

- 22 A firm manufactures two types of products A and B and sells them at a profit of Rs. 2.00 on type A and Rs. 3.00 type B. Each product is processed on two machines G and H. Type A requires one minute of processing time on G and two minutes on H. Type B requires one minute on G and one minute on H. The machine G is available for not more than six hours and forty minutes while machine H is available for ten hours during any working day. Formulate the problem as an LPP and find how many products of each type should the firm produce each day in order to get maximum profit.
- 23 Explain the characteristics of operations Research.
- 24 Explain PERT and its importance in network analysis.
- 25 Explain the difference between expected opportunity loss and expected value of perfect information.

26 Solve the following pay :—

		Player A				
		9	3	1	8	0
Player B	6	5	4	6	7	
	2	4	3	3	8	
	5	6	2	2	1	

27 Solve graphically :

Maximize  $Z = 4x_1 - 2x_2$

Subject to  $x_1 + x_2 < 14$

$3x_1 + 2x_2 > 36$

$2x_1 + x_2 < 24$

$x_1, x_2 > 0$ .

28 Find initial feasible solution to the following transportation problem.

	D1	D2	D3	Supply
O1	4	5	2	30
O2	4	1	3	40
O3	3	6	2	20
O4	2	3	7	60
Demand	40	50	60	

(5 × 2 = 10 weightage)

### Part D

*Answer any two questions.*

*Each question carries a weightage of 4.*

29 Determine the optimal transportation plan from the following table giving the plant to market shipping costs and quantities required at each market and available at each plant.

Plant	W1	W2	W3	W4	Availability
F1	22	40	14	16	100
F2	42	32	20	24	80
F3	16	24	36	18	140
Requirement	60	50	70	80	

**Turn over**

30 A project has the following time schedule :—

Activity	Time of Weeks
1-2	4
1-3	1
2-4	1
3-4	1
3-5	6
4-9	5
5-6	4
5-7	8
6-8	1
7-8	2
8-9	1
8-10	8
9-10	7

*Management*

Construct a network diagram and compute : (a) TE and TL for each event ; (b) Float for each activity ; (c) Critical path and its duration.

31 Describe the methods which are useful for decision making under uncertainty. Illustrate each by an example.

(2 × 4 = 8 weightage)

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**FOURTH SEMESTER B.B.A. DEGREE EXAMINATION, MAY 2014**

(UG—CCSS)

Complementary Course

BBIV C04—MANAGEMENT SCIENCE

Time : Three Hours

Maximum : 30 Weightage

**Part A**

*This part consists of three bunches of four questions each.*

*Each bunch carries a weightage of 1.*

*Answer all questions.*

A. Fill in the blanks by choosing the most appropriate answer from the brackets :

1 ——— theory is used to determine the optimum strategy in a competitive situation.

- (a) Decision. (b) Game.  
(c) Queueing theory. (d) Set.

2 ——— is not an assumption of linear programming.

- (a) Proportionality. (b) Additivity.  
(c) Certainty. (d) Perfect knowledge.

3 ——— refers to the total pattern of choices employed by any players.

- (a) Activity. (b) Events.  
(c) Strategy. (d) None of these.

4 ——— is an important technique of decisions under conditions of certainty.

- (a) PERT. (b) Decision tree.  
(c) Linear Programming. (d) Bayesian analysis.

B. Choose the correct answer :

5 The expected pay-off criterion EMV stands for :

- (a) Expected monetary value. (b) Expected market value.  
(c) Earnings measurement value. (d) Even measurement value.

6 The shortest possible time of an activity in PERT network diagram is :

- (a) Pessimistic time. (b) Most likely time.  
(c) Optimistic time. (d) Normal time.

Turn over

- 7 The technique most appropriate for controlling cost :
- (a) PERT. (b) CPM.  
(c) LPP. (d) BEP.
- 8 In decision-making under uncertainty, the criterion of optimism is :
- (a) Minimax. (b) Maximax.  
(c) Minimin. (d) Maximin.

C. Match the following :

- | A        | B                           |
|----------|-----------------------------|
| 9 VOM    | (a) Decision theory.        |
| 10 EOL   | (b) Network diagram.        |
| 11 Float | (c) Constraints.            |
| 12 LPP   | (d) Game theory.            |
|          | (e) Transportation problem. |
|          | (f) Queuing Theory.         |

(12 × ¼ = 3 weightage)

### Part B

*Answer all questions.*

*Each question carries a weightage of 1.*

- 13 What are deterministic models ?
- 14 Give two advantages of models in OR.
- 15 What are the steps in the formulation of LP problems ?
- 16 What do you understand by Transportation problem ?
- 17 Explain MODI method.
- 18 Define Network Analysis.
- 19 What do you understand by slack ?
- 20 Distinguish between Free float and Independent float.
- 21 What is a Dummy activity ?

(9 × 1 = 9 weightage)

### Part C

*Answer any five questions.*

*Each question carries a weightage of 2.*

- 22 Distinguish between PERT and CPM.
- 23 What are the properties of a good model ?