

IV Semester B.C.A. Degree Examination, May 2017  
 (CBCS) (F+R) (2015-16 and Onwards)  
 COMPUTER SCIENCE  
 BCA 405 : Operation Research

Time : 3 Hours

Max. Marks : 100

*Instruction : Answer all Sections.*

## SECTION – A

I. Answer **any ten** of the following :

(10×2=20)

- 1) Define OR and write any two limitations of OR.
- 2) Write the standard form of linear programming problem.
- 3) Define artificial variables with examples.
- 4) Define basic feasible solution and optimum solution in transportation problem.
- 5) Give the mathematical formulation of a transportation problem.
- 6) How do you convert a maximization problem to minimization for solving assignment problem ?
- 7) Write down the procedure to draw minimum number of lines of the reduced matrix.
- 8) Define total float and free float. Write mathematical formulae for each.
- 9) Write the steps for backward pass computation.
- 10) What are the applications of PERT/CPM techniques ?
- 11) Define maximin-minimax principle.
- 12) What is pay-off matrix ? Give an example.

## SECTION – B

II. Answer **any four** of the following :

(4×10=40)

- 13) a) Explain applications of operations research.
- b) A toy company manufactures two types of dolls, a basic version doll A and a deluxe version doll B. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum of 2000 per day. The supply of plastic is sufficient to produce 1500 dolls per day. The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes a profit of Rs. 3 and Rs. 5 per doll respectively on doll A and B, formulate this as an LPP.

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5

P.T.O.



14) a) Solve the following LPP by graphical method :

6

Maximize,  $Z = 3x + 4y$

Subject to  $4x + 8y \leq 32$

$9x + 2y \geq 14$

$3x + 10y \geq 30$

$x, y \geq 0$

b) What are the main features of an LPP in Standard form ?

4

15) a) Use Vogel's Approximation Method to obtain an initial basic feasible solution of the given transportation problem.

6

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

b) Determine an initial basic feasible solution to the following transportation problem using North-West corner rule.

4

	Destination					
	1	2	3	4	5	Supply
A	2	11	10	3	7	4
Source B	1	4	7	2	1	8
C	3	9	4	8	12	9
Demand	3	3	4	5	6	

16) a) Explain Hungarian method for solving assignment problem.

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b) The assignment cost of assigning any one operator to any one machine is given in the following table :

	Operator			
	I	II	III	IV
A	10	5	13	15
Machine B	3	9	18	3
C	10	7	3	2
D	5	11	9	7

Find the optimal assignment schedule.

5

- 17) a) Explain project evaluation and review techniques. 5  
 b) Draw the network for the project whose activities and their precedence relationships are given below :

Activity	P	Q	R	S	T	U
Predecessor	-	-	-	P, Q	P, R	Q, R

- 18) Using graphical method, solve the rectangular game whose payoff matrix for player A is 5

$$\begin{vmatrix} 2 & -1 & 5 & -2 & 6 \\ -2 & 4 & -3 & 1 & 0 \end{vmatrix}$$

10

SECTION - C

- III. Answer any four of the following :

(4x10=40)

- 19) Solve the following LPP by Simplex method :

10

Maximize :  $Z = 2x_1 + 2x_2 + 4x_3$

S.t.  $2x_1 + 3x_2 + x_3 \leq 240$

$x_1 + x_2 + 3x_3 \leq 300$

$x_1 + 3x_2 + x_3 \leq 300$

$x_1, x_2, x_3 \geq 0.$

- 20) a) Write the steps to find initial basic feasible solution by matrix minima method. 4

- b) Solve the following transportation problem by MODI method : 6

	1	2	3	4	Supply
I	21	16	25	13	11
II	17	18	14	23	13
III	32	27	18	41	19
Demand	6	10	12	15	

- 21) A company has 5 machines for assignment of 4 jobs. The time required to setup each machine for the processing of each job is given below :

		Machines				
		1	2	3	4	5
Jobs	1	10	11	4	2	8
	2	7	11	10	14	12
	3	5	6	9	12	14
	4	13	15	11	10	7

Find an optimal assignment of jobs to machines which will minimize the total setup time.

10



- 22) Construct the network for the project whose activities are given below and compute the total, free and independent float of each activities and hence determine the critical path and the project duration. 10

Activity	0-1	1-2	1-3	2-4	2-5	3-4	3-6	4-7	5-7	6-7
Duration in Weeks	3	8	12	6	3	3	8	5	3	8

- 23) Solve the following game, use dominance method to reduce the matrix, write the strategies adopted by each player and value of game : 10

		$y_1$	$y_2$	$y_3$	$y_4$	$y_5$
		$B_1$	$B_2$	$B_3$	$B_4$	$B_5$
$x_1$	$A_1$	4	4	2	-4	-6
$x_2$	$A_2$	8	6	8	-4	0
$x_3$	$A_3$	10	2	4	10	12

- 24) a) Differentiate PERT and CPM. 5

- b) Find the non-degenerate basic feasible solution for the following transportation problem by Least Cost Method : 5

		To				Supply
		10	20	5	7	10
		13	9	12	8	20
From	4	5	7	9	30	
	14	7	1	0	40	
	3	12	5	19	50	
	Demand	60	60	20	10	