MS – 575

IV Semester B.C.A. Degree Examination, May 2016
(CBCS) (Fresh) (2015-16 and Onwards)
COMPUTER SCIENCE
BCA 405 : Operations Research

Time : 3 Hours Max. Marks : 100

SECTION – A

I. Answer **any ten** of the following : **(10×2=20)**

1) Mention some of the applications of operations research.
2) Define slack and surplus variable.
3) Explain decision variables with examples.
4) Define degenerate basic feasible solution in transportation problem.
5) Explain optimal solution in transportation problem.
6) What are the different methods of solving assignment problem ?
7) Define expected time in PERT. Write its mathematical formula.
8) Explain Fulkerson's rule of numbering events.
9) Differentiate between PERT and CPM.
10) Define independent float and free float of an activity.
11) Explain principle of Dominance.
12) What is saddle point and value of the game ?

SECTION – B

II. Answer **any four** of the following : **(4×10=40)**

13) a) Explain phases of operations research. **4**

b) A firm is engaged in producing two Products A and B. Each unit of Product A requires 2 kg of raw material and 4 labour hours for processing, where as each unit of B requires 3 kg of raw materials and 3 labour hours for the same type. Every week, the firm has an availability of 60 kg of raw material and 96 labour hours. One unit of Product A sold yields Rs. 40 and one unit of Product B sold gives Rs. 35 as profit. Formulate an LPP. **6**

14) a) Write a general Linear Programming Problem (LPP) in standard form. **4**

b) Solve the following LPP by graphical method : **6**

Maximize $Z = 5x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 1000$

$x_1 \leq 400$

$x_2 \leq 700$

$x_1, x_2 \geq 0$

P.T.O.

15) Obtain initial basic feasible solution for the following transportation problem using
a) North-west corner method. 5
b) Matrix-minima method. 5

		To				Supply
		1	2	1	4	30
From		3	3	2	1	50
		4	2	5	9	20
Demand		20	40	30	10	

16) a) Explain Vogel's approximation method of solving transportation problem. 4
b) Solve the transportation problem. 6

		Destination				
		A	B	C	D	Supply
	1	11	20	7	8	50
Source	2	21	16	20	12	40
	3	8	12	18	9	70
Demand		30	25	35	40	

17) a) Explain basic components of Network. 6
b) Construct an activity-on-arrow diagram for the following dependency table of a particular project. 4

Jobs	Predecessor
a	–
b	a
c	a
d	c
e	b, c
f	d, e

18) Write short notes on :
a) Strategies used in game theory. 5
b) Maximin-Minimax principle. 5

SECTION – C

III. Answer **any four** of the following : **(4×10=40)**

19) a) Explain basic feasible solution in LPP with its types. 4
b) Solve by simplex method. 6

Maximize $Z = 4x_1 + 10x_2$

Subject to $2x_1 + x_2 \leq 50$

$2x_1 + 5x_2 \leq 100$

$2x_1 + 3x_2 \leq 90$

where $x_1, x_2 \geq 0$.

20) Obtain optimum basic feasible solution to the transportation problem. **10**

		To			Available
		7	3	2	2
From		2	1	3	3
		3	4	6	5
Demand		4	1	5	10

21) a) Explain Hungarian method for solving assignment problem. **5**

b) A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty, this estimate, of the time each man would take to perform each test, is given in this matrix below. How should the tasks be allocated, one to a man, so as to minimize the total man-house. **5**

	Men			
Tasks	**1**	**2**	**3**	**4**
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

22) a) Explain the mathematical formulation of an assignment problem. **4**

b) A company has a team of four salesmen and there are four districts where the company wants to start its business. After taking into account the capabilities of salesman and the nature of districts, the company estimates that the profit per day in rupees for each salesman in each district is given below : **6**

		Districts			
		1	**2**	**3**	**4**
	A	16	10	14	11
Salesman	**B**	14	11	15	15
	C	15	15	13	12
	D	13	12	14	15

Find the assignment of salesmen to various districts which will yield maximum profit.

23) The following table shows the jobs of PERT network with their time estimates in days.

Job i – j	Duration (Days)		
	Optimistic	Most Likely	Pessimistic
1 – 2	3	6	15
1 – 6	2	5	14
2 – 3	6	12	30
2 – 4	2	5	8
3 – 5	5	11	17
4 – 5	3	6	15
6 – 7	3	9	27
5 – 8	1	4	7
7 – 8	4	19	28

10

i) Draw the project network.

ii) Calculate the length and variance of the critical path.

iii) What is the approximate probability that the jobs on the critical path will be completed in 41 days ?

iv) What due date has about 90% chance of being met ?

24) Use the dominance principle to solve the following game.

Player B

		y_1	y_2	y_3	y_4	y_5
		1	2	3	4	5
Player A	x_1 1	6	15	30	21	6
	x_2 2	3	3	6	6	4
	x_3 3	12	12	24	36	3

10