65423

IV Semester B.C.A. Examination, September/October 2022
(CBCS) (F + R)
MATHEMATICS
Paper – IV : Operation Research

Time : 3 Hours Max. Marks : 100

Instruction : *Answer **all** the Sections.*

SECTION – A

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

1) Define Operation Research.
2) Define slack and surplus variable.
3) Define artificial variables with examples.
4) Define basic feasible solution and optimum solution in transportation problem.
5) What are the different methods in solving assignment problems ?
6) How to calculate critical path ?
7) Define expected time in PERT. Write its mathematical formula.
8) Explain Fulkerson's rule of numbering events.
9) Write the steps for backward pass computation.
10) Define independent float and free float of an activity.
11) Define :
    i) Total elapsed time
    ii) Idle time.
12) What is pay-off matrix ? Give an example.

SECTION – B

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

13) a) Explain the phases of operation research. **4**

b) A production manager wants to determine the quantity to be produced per month of Products A and B manufactured by his firm. The data on resources required and availability of resources are given below :

Resources	Requirements		Available per month
	Product A	Product B	
Raw material (kg)	60	120	12000
Machine hours (pieces)	8	5	600
Assembly man (Hour)	3	4	500
Scale price/piece	Rs. 30	Rs. 40	

Formulate the above problem as a standard linear programming problem. **6**

P.T.O.

14) a) Explain the general LPP in standard form. 4

b) Solve the following LPP by graphical method :

Maximize $z = 2x + 3y$

Subjected to the constraints

$x + 2y \leq 10$

$x + y \leq 6$

$x \leq 4$

$x, y \geq 0$ 6

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
Source	A	2	11	10	3	7	4
	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. 5

b) The assignment cost of assigning any one operator to any one machine is given in the following table : 5

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

Find the optimal assignment schedule.

17) A small project consists of seven activities for which the relevant data are given below :

Activity	Preceding Activities	Activity Duration
A	–	4
B	–	7
C	–	6
D	A, B	5
E	A, B	7
F	C, D, E	6
G	C, D, E	5

i) Draw the network and find the project completion time. 5

ii) Calculate the total float for each of the activities. 5

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) Compare between assignment problem and transportation problem. 4

b) Solve the following linear programming problem by simplex method :

Maximize $z = 5x + 3y$

Subject to the constraints

$x + y \leq 2$

$5x + 2y \leq 10$

$3x + 8y \leq 12$

$x, y \geq 0$

20) a) 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	

6

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

14) a) Explain the general LPP in standard form. 4

b) Solve the following LPP by graphical method :

Maximize $z = 2x + 3y$

Subjected to the constraints

$x + 2y \leq 10$

$x + y \leq 6$

$x \leq 4$

$x, y \geq 0$ 6

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					
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Source	A	2	11	10	3	7	4
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	Demand	3	3	4	5	6	

16) a) Explain Hungarian method for solving assignment problem. 5

b) The assignment cost of assigning any one operator to any one machine is given in the following table : 5

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

Find the optimal assignment schedule.