BIRLA INSTITUTE OF TECHNOLOGY
MESRA – 835215, RANCHI, INDIA

UG

Name: …… Roll No.: ……..

Branch: …… Signature of Invigilator: ……

Semester: VIth Date: 27/04/2022 (MORNING)

Subject with Code: **MA309 OPTIMIZATION TECHNIQUES**

Marks Obtained	Section A (30)	Section B (20)	Total Marks (50)

INSTRUCTION TO CANDIDATE

1. The booklet (question paper cum answer sheet) consists of two sections. First section consists of MCQs of 30 marks. Candidates may mark the correct answer in the space provided / may also write answers in the answer sheet provided. The Second section of question paper consists of subjective questions of 20 marks. The candidates may write the answers for these questions in the answer sheets provided with the question booklet.
2. The booklet will be distributed to the candidates before 05 minutes of the examination. **Candidates should write their roll no. in each page of the booklet.**
3. Place the Student ID card, Registration Slip and No Dues Clearance (if applicable) on your desk. All the entries on the cover page must be filled at the specified space.
4. Carrying or using of mobile phone / any electronic gadgets (except regular scientific calculator)/chits are strictly prohibited inside the examination hall as it comes under the category of unfair means.
5. No candidate should be allowed to enter the examination hall later than 10 minutes after the commencement of examination. Candidates are not allowed to go out of the examination hall/room during the first 30 minutes and last 10 minutes of the examination.
6. Write on both side of the leaf and use pens with same ink.
7. The medium of examination is English. Answer book written in language other than English is liable to be rejected.
8. All attached sheets such as graph papers, drawing sheets etc. should be properly folded to the size of the answer book and tagged with the answer book by the candidate at least 05 minutes before the end of examination.
9. The door of examination hall will be closed 10 minutes before the end of examination. Do not leave the examination hall until the invigilators instruct you to do so.
10. Always maintain the highest level of integrity. Remember you are a BITian.
11. Candidates need to **submit the question paper cum answer sheets before leaving the examination hall**.

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS:IMSC **SEMESTER : VI**

BRANCH:MATHEMATICS **SESSION :SP/22**

SUBJECT: IMM6001,OPTIMIZATION TECHNIQUES

TIME:2HOURS **FULL MARKS: 50**

INSTRUCTIONS:

1. **The question paper contains Group A compulsory section of 15 MCQ questions each of 2 marks and total of 30marks.**
2. **Candidates may attempt from Group B any 5 questions from 10 questions of maximum of 20 marks.**
3. **The missing data, if any, may be assumed suitably.**
4. **Before attempting the question paper, be sure that you have got the correct question paper.**
5. **Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.**

.....

GROUP –A (15X2)

Q1.In linear Programming Problem, it is given as "x unrestricted in sign". This means 'x' can assume the values as

a. Only positive b. only negative c. Zero d. Any value.

Q2.If phase I does not yield any solution in 2-phase method of a simplex, then we get

a. Unbounded solution b. Degeneracy c. Infeasible solution
d. Multiple Optimal Solutions.

Q3. The constraints of Maximization problem are of

(a) Greater than or equal type,
(b) Less than or equal type
(c) Less than type
(d) Greater than type.

Q4.To transfer the key row in simplex table we have to

(a) Add the elements of key row to key number
(b) Subtract the elements of key row from topmost no key row,
(c) Divide the elements of key row by key number
(d) None

Q5. If u_i and v_j are row and column numbers respectively, then the implied cost is given by:

(a) $u_i + v_j$
(b) $u_i - v_j$
(c) $u_i * v_j$
(d) u_i / v_j

Q6. In the optimal solution of an IPP by simplex method the basic variable x1 is not an integer. The corresponding row in the table is

x_B	x_1	x_2	x_3	x_4	x_5	x_6	x_7
x_1=3.25	1	3/2	-5/3	0	2	0	-11/4

A Gomary's constraint for this is

a. $1.5x_2+.33x_3+.25x_7+g_1=.25$ b. $1.5x_2+.33x_3+.25x_7-g_1=.25$

c. $1.5x_2+.33x_3+.25x_7=.25$ d. None

Q7. Consider the following LPP

Maximize $Z=3x_1+2x_2$

Subject to:

$2x_1+x_2 <=2$

$3x_1+4x_2 >=12$

$x_1, x_2 >=0$

Using the penalty M=100 for the artificial variable R, the following tableaux provide simplex iterations of the model.The solution of the problem is

Iteration	Basic	x_1	x_2	x_3	x_4	R	Solution
0	Z	-303	-402	100	0	0	-1200
x_2 enters	x_3	2	1	0	1	0	2
x_3 leaves	R	3	4	-1	0	1	12
1	z	501	0	100	402	0	-396
	x_2	2	1	0	1	0	2
	R	-5	0	-1	-4	1	4

a. Unbounded b. Infeasible c. Feasible d. None

Q8. Solving the problem by revised simplex method the variable to enter in the initial table is

Minimize $Z=x_1+2x_2$

Subject to:

$2x_1+5x_2>=6$

$x_1+x_2>=2$

$x_1,x_2>=0$

a. x_1 b.x_2 c.x_3 d.x_4

Q9. The entering and leaving variable for the problem solved by dual simplex method at the starting table is

Minimize $Z=3x_1+2x_2$

Subject to:

$3x_1+x_2 >=3$

$4x_1+3x_2 >=6$

$x_1+x_2 <=3$

$x_1,x_2 >=0$

a.$x_1;x_3$ b.$x_3;x_1$ c.x_2,x_4 d. None

Q10. Four different jobs can be done on four different machines and the take-down time costs are prohibitively high for change overs . The matrix below gives the cost in rupees for producing job i on machine j

Jobs	Machines			
	M1	M2	M3	M4
J1	5	7	11	6

J2	8	5	9	6
J3	4	7	10	7
J4	10	4	8	3

The job assigned to machine M_3 is

a. J_1 b.J_2 c.J_3 d.J_4

Q11. In solution of transportation problem by VAM in I allocation ,the penalties for row and columns for the following problem are

	DESTINATION					
		D_1	D_2	D_3	D_4	Supply
ORIGIN	O_1	11	13	17	14	250
	O_2	16	18	14	10	300
	O_3	21	24	13	10	400
	Demand	200	225	275	250	950

a. 1,4,3;5,1,0 b. 2,4,3 ;5,5,3,0 c. 4,1, 3 ;5,0,1 d. None

Q12. The name of the probability distribution used in PERT which estimates the expected duration and the expected variance of the activity is

a. α-distribution b. β –distribution d. γ-distribution e.None

Q13. For a standard normal variable Z,P(0<=z<=1)=.3413, if the expected duration of a project is 40 days and the standard deviation of the critical path is 5 days, what is the probability of completing the project in 35 days?

a. 0.5 b. 0.1587 c.0.3413 d.None

Q14. Consider the following sequencing problem, and write the optimal sequence:

Jobs:	1	2	3	4	5
M/C X	1	5	3	10	7
M/C Y	6	2	8	4	9

(a) 1 2 3 4 5 (b).1 3 5 4 2 (c)5 4 3 2 1 (d) 1 4 3 5 2

Q15. Write the sequence of performing the jobs for the problem given below:

Jobs	A	B	C	D	E
Time of machining on machine X	6	8	5	9	1

(a) They can be processed in any order,
(b) As there is only one machine, sequencing cannot be done,
(c) This is not a sequencing problem,
(d) None of the above.

GROUP-B (5x4)

Q16. Solve the following LPP graphically

Max Z=-x+2y

Subject to:

x - y<=-1

- 0.5x+y<=2

x,y>=0

Q17.Solve by Simplex method the following LPP .

Max Z=2x+5y

Subject to:

x+4y<=24

3x+y<=21

x+y<=9

x,y>=0

Q18.Find the feasible solution of the following Transportation problem using North West Corner Method

	W1	W2	W3	W4	SUPPLY
F1	14	25	45	5	6
F2	65	25	35	55	8
F3	35	3	65	15	16
DEMAND	4	7	6	13	

Q19.Write the dual of the following LPP

Maximize Z=50x+40y

Subject to:

2x+y<=30

3x+4y<=48

4x+7y<=84

x,y>=0

Q20.Use dual simplex method to solve

Max Z=3x+y

Subject to:

x+y>=1

2x+3y>=2

x,y>=0

Q21.Solve the IPP by branch and bound method

Max Z=x+y

Subject to:

3x+2y<=12

y<=2

x,y>=0

Q22.Solve the IPP by cutting plane method.

Max Z=3x+4y
Subject to:
2x+y<=6
2x+3y<=9
x,y>=0 & integers.

Q23.There are 7 jobs, each of which has to go through the machines A and B in the order AB.Processing times in hours are given as

Job: 1 2 3 4 5 6 7
Machine A: 3 12 15 6 10 11 9
Machine B: 8 10 10 6 12 1 3

Determine a sequence of these jobs that will minimize the total elapsed time T.Also find T and idle time for machines A &B.

Q24.draw the network and find the critical path for the following network details given:

Activity	Activity duration
1-2	32
1-3	48
2-3	40
2-4	12
4-5	30
3-5	54

Q25.Three time estimates(in months) of all the activities of a project are given below.

Activity	t0	tm	tp
1-2	3	4	5
2-3	6	8	10
2-4	2	3	4
3-4	4	5	12
4-5	5	7	9
5-6	9	16	17

Find the expected duration & standard deviation of each activity. Construct the project Network. Determine the critical path.

Q26.There are five jobs, each of which must go through machines A,B and C in the order ABC, processing times are given as

Job i	Processing Times		
	A_i	B_i	C_i
1	8	5	4
2	10	6	9
3	6	2	8
4	7	3	6
5	11	4	5

Determine a sequence for five jobs that will minimize the elapsed time T.