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

CLASS: BE **SEMESTER :VI**
BRANCH: IT **SESSION : SP/19**

SUBJECT: IT6027-OPTIMIZATION TECHNIQUES

TIME: 3.00 Hrs. **FULL MARKS: 60**

INSTRUCTIONS:
1. **The question paper contains 7 questions each of 12 marks and total 84 marks.**
2. **Candidates may attempt any 5 questions maximum of 60 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.**

Q.1 Solve the following LPP by using simplex method [12]

Maximize $Z = 5x_1 + 3x_2$
subject to $x_1 + x_2 \leq 2$
$5x_1 + 2x_2 \leq 10$
$3x_1 + 8x_2 \leq 12$
and $x_1, x_2 \geq 1$

Q.2 Use two-phase method to solve [12]

Minimize $Z = x_1 + x_2$
Subject to $2x_1 + 4x_2 \geq 4$
$x_1 + 7x_2 \geq 7$
and $x_1, x_2 \geq 0$

Q.3 Apply revised simplex method to solve [12]

Maximize $Z = x_1 + x_2 + 3x_3$
Subject to $3x_1 + 2x_2 + x_3 \leq 3$
$2x_1 + x_2 + 2x_3 \leq 2$
and $x_1, x_2, x_3 \geq 0$

Q.4(a) State principle of optimality and use it to solve [6]

Minimize $Z = y_1^2 + y_2^2 + y_3^2$
Subject to $y_1 + y_2 + y_3 \geq 12$
and $y_1, y_2, y_3 \geq 0$

Q.4(b) A student has to take examination in three courses X,Y, and Z. He has three days available to study and feels to devote a whole day to study the same course. His estimates of grades he may get by study are as follows: **[6]**

Study days \ Course	X	Y	Z
0	1	2	1
1	2	2	2
2	2	4	4
3	4	5	4

How he should plan to study so that he maximizes the sum of his grades. Use dynamic programming approach.

Q.5 Solve the following integer programming problem by using branch and bound method. [12]

Maximize $Z = 6x_1 + 8x_2$
Subject to $4x_1 + 16x_2 \leq 32$
$14x_1 + 4x_2 \leq 28$
and $x_1, x_2 \geq 0$ and are integers.

PTO

Q.6(a) Find Kuhn- Tucker's necessary conditions for solving maximizing a non-linear function subject to some constraints. [6]

Q.6(b) Maximize $Z = (200x_1 - 2x_1^2) + (500x_2 - 3x_2^2)$ [6]

Subject to $2x_1 + x_2 \leq 140$

$2x_1 + 3x_2 \leq 180$

And $x_1, x_2 \geq 0$

when all lagrange's multipliers are equal and not equal to zero respectively.

Q.7(a) Discuss birth-death process respect to queuing theory. [8]

Q.7(b) In a railway marshalling yard, good trains arrive at a rate of 45 trains per day. Assuming that both the inter-arrival time and the service-time with an average of 36 minutes follow an exponential distributions, calculate [4]

(i) the mean queue size

(ii) the probability that the queue size exceeds 10

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