University of Mumbai

Examinations Commencing from 1st June 2022 to 15th June 2022

Program: Mechanical Engineering

Curriculum Scheme: **REV- 2019 'C' Scheme**

Examination: BE Semester V

Course Code: MEDLO5011 and Course Name: Optimization Techniques

Duration: 3 hour Max. Marks: 80

Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks 2 marks each**
1.	In simplex, maximization problem is optimal when all ($C_j - Z_j$) values are
Option A:	Either zero or negative
Option B:	Either zero or positive
Option C:	Only positive
Option D:	Only negative
2.	Objective function of a linear programming problem is
Option A:	a constraint
Option B:	function to be optimized
Option C:	A relation between the variables
Option D:	None of these
3.	A set of values of decision variables which satisfies the linear constraints and nn-negativity conditions of a L.P.P. is called its
Option A:	Unbounded solution
Option B:	Optimum solution
Option C:	Feasible solution
Option D:	None of these
4.	The maximum value of the object function $Z = 5x + 10y$ subject to the constraints $x + 2y \le 120$, $x + y \ge 60$, $x - 2y \ge 0$, $x \ge 0$, $y \ge 0$ is
Option A:	600
Option B:	300
Option C:	400
Option D:	800
5.	The maximum value of $Z = 4x + 2y$ subject to the constraints $2x + 3y \le 18$, $x + y \ge 10$, $x, y \le 0$ is
Option A:	36
Option B:	40
Option C:	30
Option D:	None of these
6.	The signal power and noise power are indicated by S & N respectively. If the signal power increases to 2S and the noise power reduce by half. The ratio of the old SNR to the new SNR is given by …
Option A:	¼
Option B:	1/6
Option C:	6
Option D:	2/3

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7.	In which method of MADM, each attribute is given a weight & sum of all weight must be equal to 1.
Option A:	SAW
Option B:	WPM
Option C:	ANP
Option D:	AHP
8.	In data normalization first decide the attribute is either beneficial or non beneficial. If beneficial then…
Option A:	Put 1 at a place of maximum value and then divide that element to other elements in that colomn so division will be less than 1.
Option B:	Put 1 at a place of minimum value and then divide that element to other elements in that column so division will be less than 1.
Option C:	Put 1 at a place of maximum value and then divide that element to other elements in that colomn so division will be greater than 1.
Option D:	Put 1 at a place of minimum value and then divide that element to other elements in that column so division will be greater than 1.
9.	The Taguchi approach related to loss is:
Option A:	Loss as long as the part deviates from target
Option B:	Loss as long as the part stick to target
Option C:	Loss as long as the part cross the UCL
Option D:	Loss as long as the part cross the LCL
10.	A production process makes parts for $10^{\pm 0.2}$ at a cost of Rs. 25/- each. Determine loss when part is made at 10.10
Option A:	7.25
Option B:	6.25
Option C:	5.25
Option D:	6.70

Q2.	**Solve any Two Questions out of Three 10 marks each**
A	Find the maximum and minimum value of $y = 3x^5 - 5x^3$. At $x = 0$, = 0 x is a point of inflexion At x = 1, = 30 i.e. y is minimum at x = 1 At x = -1, = - 30 < 0, y is maxi at x = - 1
B	Show that the right circular cylinder of given surface (including its ends) and maximum volume is such that its height is equal to twice its radius.
C	Use dynamic programming technique to solve the following problem. Max $Z = X_1.X_2.X_3.X_4$ Subject to $X_1 + X_2 + X_3 + X_4 = 12$ $X_1, X_2, X_3, X_4 \geq 0$

Q3.	**Solve any Two Questions out of Three 10 marks each**
A	Solve by simplex method following LP: Max. $Z = 50X1 + 80X2$ subjected to, $X_1 + 1.5X_2 \leq 600$ $0.2X_1 + 0.2X_2 \leq 100$ $0.1X_2 \leq 30$, $X_1, X_2 \geq 0$.
B	Solve the following NLPP: Maximum $Z = 4x_1 + 6x_2 - 2x_1x_2 - 2x_2^2$ subjected to $x_1 + 2x_2 = 2$, $x_1, x_2 \geq 0$.
C	Explain the concept of Sub-optimization and principle of optimality with an example.
Q4.	**Solve any Two Questions out of Three 10 marks each**
A	Maximize: $(y_1.y_2.y_3)$, Subjected to, $y_1 + y_2 + y_3 = 10$ and $y_1, y_2, y_3 \geq 0$.
B	A firm manufacture product A & B which pass through machining and finishing departments. Machining has 90 hours available; finishing can handle up to 72 hours of work. Manufacturing one product A requires 6 hours in machining and 3 hours in finishing. Each product B requires 3 hours in machining and 6 hours in finishing. If profit is Rs. 120/- per product A and Rs. 90/- per product B. Determine the best combination of product A & B to realize profit of Rs. 2100.
C	What are the various applications of optimization problems?
Q5.	**Solve any Two Questions out of Three 10 marks each**
A	Explain with the help of example, how optimization problems are classified based on: i) Single value objective function ii) Multi value objective function
B	Use the Kuhn – Tucker condition to solve the following non-linear programming problem: Maximize $Z = 2x_1 - x_1^2 + x_2$, subject to the constraints, $2x_1 + 3x_2 \leq 6$, $2x_1 + x_2 \leq 4$, $x_1, x_2, \geq 0$.
C	What do you understand by the term 'penalty' in a constrained multivariable optimization problem? Explain how it is used to optimize multidimensional nonlinear programming problems.