University of Mumbai

Examination 2020 under cluster RAIT

Examinations Commencing from 7th January 2021 to 20th January 2021

Program: **Instrumentation Engineering**

Curriculum Scheme: Rev 2016

Examination: TE Semester V

Course Code: ISDLO5012 and Course Name: Optimization Techniques

Time: 2 hour Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Decision variables are
Option A:	Controllable
Option B:	Uncontrollable
Option C:	Parameters
Option D:	None of the above
2.	An optimization model
Option A:	Mathematically provides the best decision
Option B:	Provides decision within its limited context
Option C:	Helps in evaluating various alternatives constantly
Option D:	All of the above
3.	In linear programming, constraints can be represented by
Option A:	equalities
Option B:	inequalities
Option C:	ratios
Option D:	both a and b
4.	One subset which satisfies inequality part of equation is graphically represented by
Option A:	domain area of y intercept
Option B:	range area of x intercept
Option C:	straight line
Option D:	shaded area around straight line
5.	Feasible region's optimal solution for a linear objective function always includes
Option A:	downward point
Option B:	upward point
Option C:	corner point
Option D:	front point
6.	The objective functions and constraints are linear relationship between -------------
Option A:	Variables
Option B:	Constraints
Option C:	Functions
Option D:	All of the above

7.	Graphic method can be applied to solve a LPP when there are only ------------- variable
Option A:	One
Option B:	More than One
Option C:	Two
Option D:	Three
8.	If the feasible region of a LPP is empty, the solution is --------------------
Option A:	Infeasible
Option B:	Unbounded
Option C:	Alternative
Option D:	None of the above
9.	In simplex method basic solution set as (n-m), all variables other than basic are classified as
Option A:	constant variable
Option B:	non positive variables
Option C:	basic variables
Option D:	non-basic variable
10.	Third requirement of simplex method is that all variables are restricted to include
Option A:	negative even values
Option B:	odd values
Option C:	even values
Option D:	non-negative values
11.	The variables whose coefficient vectors are unit vectors are called ------------
Option A:	Unit Variables
Option B:	Basic Variables
Option C:	Non basic Variables
Option D:	None of the above
12.	In linear programming, related problems in linear programming are classified as
Option A:	dual variables
Option B:	single problems
Option C:	double problems
Option D:	dual problems
13.	A function of one argument is maximized when the first derivative
Option A:	is zero and the second derivative is positive
Option B:	is positive and the second derivative is negative
Option C:	is zero and the second derivative is negative
Option D:	is negative and the second derivative is positive
14.	A "= type" constraint expressed in the standard form is active at a design point if it has
Option A:	zero value
Option B:	more than zero value
Option C:	less than zero value
Option D:	a & c

15.	When the optimization problem cost functions are differentiable, the problem is referred to as
Option A:	rough
Option B:	nonsmooth
Option C:	smooth
Option D:	a & b
16.	Which variables are fictitious and cannot have any physical meaning
Option A:	Optimal variable
Option B:	Decision variable
Option C:	Artificial variable
Option D:	Control variable
17.	For the points A = 0, B = 1.5, C = 3 and D = 4.5; f(A) = 20.66, f(B) = 13.75, f(C) = 13.75 and f(D) = 17.22. Which interval should be considered for locating the minimum of 'f'.
Option A:	A – B
Option B:	B – C
Option C:	A - B – C
Option D:	B - C – D
18.	The DFP method uses a positive definite symmetric matrix, to approximate the ________ of f(x).
Option A:	inverse of Hessian matrix
Option B:	inverse of gradient vector
Option C:	Hessian matrix
Option D:	gradient vector
19.	In Conjugate gradient method, the direction used to identify next point in the 1st iteration is
Option A:	gradient vector
Option B:	negative of the gradient vector
Option C:	hessian matrix
Option D:	inverse of Hessian matrix
20.	In the _________ method, in order to establish upper and lower bounds on the optimal step size, two points A and B are considered such that the slope of the function has different signs.
Option A:	Quadratic interpolation
Option B:	Cubic Interpolation
Option C:	SDM
Option D:	Fletcher-Reeves

Q2 **(20 Marks)**	
A	**Solve any One** **10 marks each**
i.	Formulate and solve the optimization problem. An assembly line consisting of three consecutive stations produces two radio models: HiFi-1 and HiFi-2. The following table provides the assembly times for the three workstations. <table><tr><td rowspan="2">Workstation</td><td colspan="2">Minutes per unit</td></tr><tr><td>HiFi-1</td><td>HiFi-2</td></tr><tr><td>1</td><td>6</td><td>4</td></tr><tr><td>2</td><td>5</td><td>5</td></tr><tr><td>3</td><td>4</td><td>6</td></tr></table>The daily maintenance for stations 1, 2, and 3 consumes 10%, 14%, and 12%, respectively, of the maximum 480 minutes available for each station each day. The company wishes to determine the optimal product mix that will minimize the idle (or unused) times in the three workstations.
ii.	Solve by Simplex method Maximize $Z = 12x_1 + 15x_2 + 14x_3$ Subject to $-x_1 + x_2 \le 0$ $-x_2 + 2x_3 \le 0$ $x_1 + x_2 + x_3 \le 100$ $x_1, x_2, x_3 \ge 0$
B	**Solve any One** **10 marks each**
i.	Find the minimum of the function $f(x) = 10x^6 - 48x^5 + 15x^4 + 200x^3 - 120x^2 - 480x + 100$
ii.	Define local and global minima and maxima with example. State necessary and sufficient conditions for single variable optimization with no constraints.

Q3 **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Explain the terms Design variables and Objective function
ii.	Discuss properties of gradient vector
iii.	Explain global and local maxima with an example.
B	**Solve any One** **10 marks each**
i.	Solve by Two Phase method Maximize $f = x_1 + x_2 + 2x_3$ S. T. $2x_1 + x_2 + 2x_3 \le 8$ $x_1 + x_2 + x_3 \ge 2$ $-x_1 + x_2 + 2x_3 = 1$ $x_1, x_2, x_3 \ge 0$
ii.	Minimize $f(x_1, x_2) = x_1^2 + x_2^2 - 2x_1 x_2$ using Steepest Descent Method starting at point (1,0).