22MAP104N/ 22MAP104

PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2024
(First Semester)

Branch – **MATHEMATICS**

OPTIMIZATION TECHNIQUES

Time: Three Hours — Maximum: 75 Marks

SECTION-A (10 Marks)
Answer **ALL** questions
ALL questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	_________Algorithm allows the determination of the shortest route between any two nodes in the network. a) Minimal Spanning Tree b) Dijkstra's c) Floyd's d) Maximal Flow	K1	CO1
	2	A _____ defines a set of arcs which when deleted from the network will cause a total disruption of flow between the source and sink nodes. a) cut b) cut capacity c) backtracking d) residual	K2	CO1
2	3	In Forward recursion the computations of shortest distance from node xi at stage I, when i=0 is ____ a) 0 b) 1 c) 2 d) 3	K1	CO2
	4	The number of stages in a dynamic programming problem is equal to ___________ variables. a) number of artificial b) number of decision c) number of basic d) number of non-basic	K2	CO2
3	5	__________ Method is an extension case of the subinterval method. a) Replication b) Regenerative c) Acceptance-Rejection d) Convolution	K1	CO3
	6	The most common arithmetic operation for generating (0,1) random numbers is the _______method. a) pseudo-random numbers b) subinterval c) multiplicative congruential d) Replication	K2	CO3
4	7	If $f''(y_0) > 0$ where y_0 is a stationary point then y_0 is a _______ point a) maximum b) minimum c) inflection d) indefinite	K1	CO4
	8	If there is m equations and n unknowns with $m > n$, then atleast _____ equations are redundant. a) $m + n$ b) $m \leq - n$ c) $m = n$ d) $m \leq n$	K2	CO4
5	9	Direct search method is also known as ___ method. a) Golden search b) Dichotomous c) Gradient d) none	K1	CO5
	10	If the matrix D in Quadratic programming problem is symmetric and negative definite then Z is _____ a) convex b) concave c) strictly convex d) strictly concave	K2	CO5

Cont...

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Describe the Linear Programming formulation of the Shortest –Route problem.	K3	CO1
		(OR)		
	11.b.	Find the shortest route for the following problem: $d(1,2) = 3, d(1,3) = 10, d(2,4) = 5,$ $d(3,4) = 6, d(3,5) = 15, d(4,5) = 4.$		
2	12.a.	Suppose that you want to invest \$4000 now and \$2000 at the start of years 2 to 4. The interest rate offered by First Bank is 8% compounded annually, and the bonuses over the next 4 years are 1.8%, 1.7%, 2.1%, and 2.5%, respectively. The annual interest rate offered by Second Bank is .2% lower than that of First Bank, but its bonus is .5% higher. The objective is to maximize the accumulated capital at the end of 4 years.	K4	CO2
		(OR)		
	12.b.	Describe Backward Recursive Approach.		
3	13.a.	Apply the acceptance-rejection to the following beta distribution: $f(x) = 6x(1-x), 0 \leq x \leq 1.$	K4	CO3
		(OR)		
	13.b.	Explain Erlang Distribution.		
4	14.a.	State and prove the sufficient condition for stationery point X_0, to be an extremum point of f(x)	K5	CO4
		(OR)		
	14.b.	Determine the stationary point of function: $f(x_1, x_2, x_3) = x_1 + 2x_3 + x_2x_3 - x_1^2 - x_2^2 - x_3^2.$		
5	15.a.	Solve by using Linear combination method Max $f(x_1, x_2) = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$ subject to constraints $x_1 + 2x_2 \leq 2,$ and $x_1, x_2 \geq 0.$	K4	CO5
		(OR)		
	15.b.	Solve by Direct search method with $\Delta = 0.05,\ f(x) = x\sin\pi x,\ 1.5 \leq x \leq 2.5.$		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Write an Algorithm for Maximal flow.	K4	CO1
2	17	A construction contractor estimates that the size of the work force needed over the next 5 weeks to be 5, 7, 8, 4, and 6 workers, respectively. Excess labor kept on the force will cost \$300 per worker per week, and new hiring in any week will incur a fixed cost of \$400 plus \$200 per worker per week. Determine the optimum solution.	K5	CO2
3	18	Explain Single Server Model.	K4	CO3
4	19	Solve by Lagrangean Method Min f(x) = $x_1^2 + x_2^2 + x_3^2$, subject to constraints $x_1 + x_2 + 3x_3 - 2 = 0,\ 5x_1 + 2x_2 + x_3 - 5 = 0$ and $x_1, x_2, x_3 \geq 0.$	K5	CO4
5	20	Solve by Quadratic Programming Problem Max $Z = 4x_1 + 6x_2 - 2x_1^2 - 2x_1x_2 - 2x_2^2$ subject to constraints $x_1 + 2x_2 \leq 2,$ and $x_1, x_2 \geq 0$	K5	CO5

Z-Z-Z END