LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

U.G. DEGREE EXAMINATION – **ALLIED**

THIRD SEMESTER – **APRIL 2023**

16/17/18UMT3AL01 – BUSINESS MATHEMATICAL TECHNIQUE

Date: 10-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

SECTION A

Answer **ALL** the questions: **(10 x 2 = 20)**

1. The total cost function of a firm is given by $C = 0.04x^3 - 0.9x^2 + 10x^1 + 10$. Find the Average cost.
2. Integrate $\int 5x^2 dx$
3. State any two properties of definite integral.
4. Define linear programming problem.
5. What is duality?
6. Define Objective function.
7. What are the methods of finding the initial basic feasible solution in the transportation problem?
8. When an assignment problem is said to be unbalanced?
9. What is a project?
10. Define Critical Path.

SECTION B

Answer any **FIVE** questions: **(5 x 8 = 40)**

11. The marginal cost function of a product is given by $\frac{dC}{dq} = 100 - 10q + 0.1q^2$, where q is the output.

    Obtain the total and the average cost function of the firm under the assumption that its fixed cost is Rs.500.

12. If $y = \left(x + \sqrt{1 + x^2}\right)^m$ then show that $(1 + x^2)y_2 + xy_1 = m^2 y$.

13. Integrate $\frac{x}{(x-1)(2x+1)}$ with respect x.

14. Find the consumer surplus and producer surplus under pure competition for demand function $p = \frac{8}{x+1} - 2$ and supply function $p = \frac{1}{2(x+3)}$, where p is the price and x is the quantity.

15. Solve the Linear programming problem graphically:

    Maximize Z= $15x_1 + 10x_2$,

    Subject to the constraints $4x_1 + 6x_2 \leq 360$, $3x_1 \leq 180$, $5x_2 \leq 200$ and $x_1, x_1 \geq 0$.

16. Find the solution of the following transportation model by using (i) North West Corner Rule and (ii) Least Cost method:

	I	II	III	IV	**Demand**
A	2	11	10	3	**4**
B	1	4	7	2	**8**
C	3	9	4	8	**4**
Supply	**3**	**3**	**4**	**6**	

17. Consider the problem of assigning five jobs to five persons. The assignment costs are given as follows: Determine the optimum assignment schedule.

		Job				
Person		**1**	**2**	**3**	**4**	**5**
	A	8	4	2	6	1
	B	0	9	5	5	4
	C	3	8	9	2	6
	D	4	3	1	0	3
	E	9	5	8	9	5

18. Draw the network for the following:

Activity	A	B	C	D	E	F	G	H	I	J	K
Immediate Predecessor	-	-	-	A	B	B	C	D	D	H, I	F, G

SECTION C

Answer any **TWO** questions: **(2 x 20 = 40)**

19. (a) Find $\frac{dy}{dx}$, if $y = x^x$.

(b) Find the maximum and minimum values of the function $x^4 + 2x^3 - 3x^2 - 4x + 4$. (8+12)

20. (a) Solve the following Linear Programming problem using simplex method:

Maximize $Z = 10x_1 + x_2 + 2x_3$
Subject to the constraints $x_1 + 2x_2 - 2x_3 \leq 10$; $4x_1 + x_2 + x_3 \leq 20$ and $x_1, x_2, x_3 \geq 0$

(b) Calculate $I = \int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{sinx}+\sqrt{cosx}}$ dx (13+7)

21. Solve the transportation problem:

	1	**2**	**3**	**4**	**Supply**
I	21	16	25	13	11
I	17	18	14	23	13
I	32	27	18	41	19
Demand	6	10	12	15	

(20)

22. Find the Critical path and the project duration for the following network

Activity	1 – 2	1 – 3	2 – 4	2 – 5	3 – 4	4 – 5
Time(Days)	8	4	10	2	5	3

(20)

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