LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Com. B.A. DEGREE EXAMINATION – **CORPORATE SECRETARYSHIP & ECONOMICS**

THIRD SEMESTER – **APRIL 2018**

MT 3204– BUSINESS MATHEMATICS

Date: 04-05-2018 Dept. No. Max. : 100 Marks

Time: 01:00-04:00

PART – A

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

1. Find the first derivative of xe^x with respect to *x*.
2. Find $\frac{\partial u}{\partial x}$ and $\frac{\partial u}{\partial y}$ when u(x,y) = $x^3y + 9x^4 - 2y^2$.
3. Evaluate $\int (3 + 2x - x^4)\, dx$.
4. Define consumer surplus.
5. What is a slack variable?
6. Write the dual of the following LPP.

   Maximize Z = $2x_1 + x_2 + 5x_3$

   Subject to the constraints $x_1 + 5x_2 + x_3 \leq 12$

   $2x_1 - x_2 - x_3 \leq 3$

   $2x_1 - 2x_2 - 3x_3 \leq 8, x_1, x_2, x_3 \geq 0$
7. What is an unbalanced transportation problem?
8. What is an assignment problem?
9. Define project in network analysis.
10. Define critical path in a network.

PART – B

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

11. If $y = (x + \sqrt{1 + x^2})^m$, show that $(1 + x^2)y_2 + xy_1 = m^2$y.
12. Find the maximum value of the function $\frac{\log x}{x}$ for $x > 0$.
13. Evaluate $\int \frac{(6x+5)}{\sqrt{6+x-2x^2}}\, dx$.
14. Solve the following LPP by the graphical method.

    Maximize Z = $3x_1 + 4x_2$

    Subject to the constraints $x_1 + x_2 \leq 450$

    $2x_1 + x_2 \leq 600$

    and $x_1, x_2 \geq 0$.

15. Determine consumer surplus and producer surplus under pure competition for the demand function $p = 36 - x^2$ and supply function $p = 6 + \frac{x^2}{4}$, where p is the price and $x$is the quantity.

16. Consider the problem of assigning four jobs to four persons. The assignment costs are given as follows.

Persons

$$\begin{array}{c} \\ J_1 \\ J_2 \\ J_3 \\ J_4 \end{array} \begin{array}{c} \begin{array}{cccc} P_1 & P_2 & P_3 & P_4 \end{array} \\ \begin{pmatrix} 5 & 7 & 11 & 6 \\ 8 & 5 & 9 & 6 \\ 4 & 7 & 10 & 7 \\ 10 & 4 & 8 & 3 \end{pmatrix} \end{array}$$

Jobs

Find the optimal assignment.

17. Draw the network for the project whose activity and precedence relationships are given below.

Activity	A	B	C	D	E	F	G	H	I
Predecessor	–	A	A	–	D	B,C,E	F	E	G,H

18. Find the initial transportation cost of the following matrix using North West corner method and least cost method.

		Destination				
		D_1	D_2	D_3	D_4	Availability
Origin	O_1	1	2	1	15	30
	O_2	3	3	2	1	50
	O_3	15	2	5	9	20
Demand		20	40	30	10	

PART – C

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

19.a) Find the maxima and minima of the function $u(x, y) = y^4 + 2(x^2 - y^2) - x^4$.

b) Evaluate $\int_0^{\pi/2} \frac{cos^4 x}{sin^4 x + cos^4 x} dx$. (14 + 6)

20.Solve the following linear programming problem by simplex method.

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to constraints $x_1 + 4x_2 \leq 420$

$3x_1 + 2x_3 \leq 460$

$x_1 + 2x_2 + x_3 \leq 430$

and $x_1, x_2, x_3 \geq 0$.

21. Construct a network for the project whose activities and the three time estimates namely optimistic time t_o, most likelihood time t_m and pessimistic time t_p of these activities (in weeks) are given below. Compute

a) Expected duration of each activity

b) Expected variance of each activity and also fine the critical path of the project and the expected project duration.

Activity	**1- 2**	**2-3**	**2-4**	**3-5**	**4-5**	**4-6**	**5-7**	**6-7**	**7-8**	**7-9**	**8-10**	**9-10**
t_o	3	1	2	3	1	3	4	6	2	1	4	3
t_m	4	2	3	4	3	5	5	7	4	2	6	5
t_p	5	3	4	5	5	7	6	8	6	3	8	7

22. Find the optimal transportation cost of the following transportation problem by modified distribution (MODI) method.

		Destination				
		D_1	D_2	D_3	D_4	Availability
Origin	O_1	11	20	7	8	50
	O_2	21	16	20	12	40
	O_3	8	12	18	9	70
Demand		30	25	35	40	

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