DALMIA HIGHER SECONDARY SCHOOL, DALMIAPURAM
BUSINESS MATHS AND STATISTICS MARKS: 90

STD: 12 MODEL QUARTERLY EXAM - 2022 -23 TIME:3hrs

==========

PART-A

I.CHOOSE THE BEST ANSWER : **(20 x 1 = 20)**

1. The rank of the unit matrix of order n is (a) n −1 (b) n (c) n +1 (d) n^2

2 If the number of variables in a non-homogeneous system AX = B is n, then the system possesses a unique solution only when

(a) $\rho(A) = \rho(A,B) > n$ (b) $\rho(A) = \rho(A,B) = n$

(c) $\rho(A) = \rho(A,B) < n$ (d) none of these

3. Cramer's rule is applicable only to get an unique solution when

(a) $\Delta_z \neq 0$ (b) $\Delta_x \neq 0$ (c) $\Delta \neq 0$ (d) $\Delta_y \neq 0$

4. $\int 2^x$ dx is (a) $2^x log\ 2 + c$ (b) $2^x + c$ (c) $\frac{2^x}{log\ 2} + c$ (d) $\frac{log\ 2}{2^x} + c$

5. $\int e^{2x}[2x^2 + 2x]$ dx is

(a) $e^{2x}x^2 + c$ (b) $xe^{2x} + c$ (c) $2x^2 e^2 + c$ (d) $\frac{x^2e^x}{2} + c$

6. Using the factorial representation of the gamma function, which of the following is the solution for the gamma function Γ(n) when n = 8

(a) 5040 (b) 5400 (c) 4500 (d) 5540

7. $\int_0^\infty x^4 e^{-x} dx$ is (a) 12 (b) 4 (c) 4! (d) 64

8. Area bounded by the curve y = x (4 − x) between the limits 0 and 4 with x − axis is

(a) $\frac{30}{3}$ sq.units (b) $\frac{31}{2}$ sq.unit (c) $\frac{32}{3}$ sq.units (d) $\frac{15}{2}$ sq.units

9. The given demand and supply function are given by D(x)= 20 − 5x and S(x) = 4x + 8 if they are under perfect competition then the equilibrium demand is

(a) 40 (b) $\frac{41}{2}$ (c) $\frac{40}{3}$ (d) $\frac{41}{5}$

10. The profit of a function p(x) is maximum when

(a) MC − MR = 0 (b) MC=0 (c) MR=0 (d) MC+MR=0

11. The integrating factor of the differential equation $\frac{dx}{dy} + Px = Q$ is

(a) $e^{\int p\ dx}$ (b) $\int p\ dx$ (c) $\int p\ dy$ (d) $e^{\int p\ dy}$

12. The particular integral of the differential equation f (D) y = e^{ax} where f (D) = $(D - a)^2$

(a) $\frac{x^2}{2} e^{ax}$ (b) xe^{ax} (c) $\frac{x}{2} e^{ax}$ (d) x^2e^{ax}

13 Which of the following is the homogeneous differential equation?

(a) $(3x - 5)\,dx = (4y - 1)\,dy$ (b) $xy\,dx - (x^3 + y^3)\,dy = 0$

(c) $y^2\,dx + (x^2 - xy - y^2)\,dy = 0$ (d) $(x^2 + y)\,dx = (y^2 + x)\,dy$

14. The P.I of $(3D^2 + D - 14)\,y = 13e^{2x}$ is ---- (a) $\frac{x}{2} e^{2x}$ (b) xe^{2x} (c) $\frac{x^2}{2} e^{2x}$ (d) $13\,xe^{2x}$

15. $\Delta^2 y_0 =$

(a) $y_2 - 2y_1 + y_0$ (b) $y_2 + 2y_1 \quad y_0$ (c) $y_2 + 2y_1 + y_0$ (d) $y_2 + y_1 + 2\,y_0$

16. If m and n are positive integers then $\Delta^m \Delta^n f(x) =$

(a) $\Delta^{m+n} f(x)$ (b) $\Delta^m f(x)$ (c) $\Delta^n f(x)$ (d) $\Delta^{m-n} f(x)$

17. . If $f(x) = x^2 + 2x + 2$ and the interval of differencing is unity then $\Delta f(x)$

(a) $2x - 3$ (b) $2x + 3$ (c) $x + 3$ (d) $x - 3$

18 . Given E(X) = 5 and E(Y) = -2, then E(X – Y) is (a) 3 (b) 5 (c) 7 (d) –2

19. A discrete probability distribution may be represented by

(a) table (b) graph (c) mathematical equation (d) all of these

20. The distribution function F(x) is equal to

(a) $P(X = x)$ (b) $P(X \leq x)$ (c) $P(X \geq x)$ (d) all of these

PART -B

II. TWO MARK QUESTIONS **(7 X 2 = 14)**

21. Find the rank of the matrix $\begin{bmatrix} 1 & 4 \\ 2 & 8 \end{bmatrix}$

22. Show that the equations $3x - 2y = 6$, $6x - 4y = 10$ $3x - 2y = 6$, $6x - 4y = 10$ are inconsistent.

23. Evaluate $\int x\, e^x \, dx$

24 . Evaluate $\int_0^\infty e^{-4x}\, x^4 \, dx$

25. If the marginal revenue function for a commodity is $MR = 9 - 4x^2$. Find the demand function.

26. Find the area bounded by $y = 4x + 3$ with x- axis between the lines $x = 1$ and $x = 4$

27. Solve: $(x^2 + x + 1)dx + (y^2 - y + 3)dy = 0$

28. Construct a forward difference table for the following data

x	0	10	20	30
y	0	0.174	0.347	0.518

29. Find Δe^{ax}

30. Th e discrete random variable X has the probability function

X	1	2	3	4
P(X=x)	K	2k	3k	4k

Show that k = 0.1

PART - C

III. THREE MARK QUESTIONS (7 X 3=21)

(ANSWER ANY 7, QNO:40 IS COMPULSORY)

31. The total cost of 11 pencils and 3 erasers is ₹ 64 and the total cost of 8 pencils and 3 erasers is ₹49. Find the cost of each pencil and each eraser by Cramer's rule.

32. Parithi is either sad (S) or happy (H) each day. If he is happy in one day, he is sad on the next day by four times out of five. If he is sad on one day, he is happy on the next day by two times out of three. Over a long run, what are the chances that Parithi is happy on any given day?

33. . Evaluate $\int_1^4 f(x)$ dx ,where $f(x) = \begin{cases} 4x+3 & ,if\ 1 \leq x \leq 2 \\ 3x+5 & ,if\ 2 \leq x \leq 4 \end{cases}$

34. Evaluate $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} sin\, x\, dx$

35 . If MR = $20 - 5x + 3x^2$, find total revenue function.

36. Mr. Arul invests ₹10,000 in ABC Bank each year, which pays an interest of 10% per annum compounded continuously for 5 years. How much amount will there be after 5 years. ($e^{0.5} = 1.6487$)

37. Find the differential equation of the family of all straight lines passing through the origin.

38. solve : $sec^2x\ tany\ dx + sec^2y\ tanx\ dy=0$

39.prove that $f(4)= f(3) + \Delta f(2) + \Delta^2 f(1) + \Delta^3 f(1)$ taking '1' as the interval of differencing

40. In an investment, a man can make a profit of Rs.5,000 with a probability of 0.62 or a loss of Rs.8,000 with a probability of 038 . Find the expected gain.

PART – D

IV FIVE MARK QUESTIONS (7 X 5 = 35)

(ANSWER ALL THE QUESTIONS)

41(a) . Investigate for what values of a and 'b' the following system of equations x + y + z = 6, x + 2y + 3z = 10, x + 2y + az = b + 2y + 3z = 10, x + 2y + az = b have (i) no solution (ii) a unique solution (iii) an infinite number of solutions

[OR]

41(b) . using properties of definite integrals , Evaluate $\int_0^1 \frac{x}{(1-x)^{\frac{3}{4}}}$ dx

42(a). Using integration find the area of the circle whose center is at the origin and the radius is a unit.

[OR]

42(b). suppose that the quantity demanded Q_d = 29 – 2p - 5$\frac{dp}{dt}$ + $\frac{d^2p}{dt^2}$ and quantity supplied$s$ Q_s = 5 + 4p where p is the price. Find the equilibrium price for market clearance.

43(a). From the following table find he missing value

X	2	3	4	5	6
f(x)	45.0	49.2	54.1	-	67.4

[OR]

43(b). The probability density function of a random variable X is
f(x) = k $e^{-|x|}$, $-\infty < x < \infty$ Find the value of k and also fi nd mean and variance for the random variable.

44(a). Solve the following equations by using Cramer's rule
x + y + z = 6, 2x + 3y − z = 5, 6x − 2y − 3z = − 7

[OR]

44(b). Elasticity of a function $\frac{E_y}{E_x}$ is given by $\frac{E_y}{E_x} = \frac{-7x}{(1-2x)(2+3x)}$. Find the function When x = 2 y = $\frac{3}{8}$.

45(a). The amount of bread (in hundreds of pounds) x that a certain bakery is able to sell in a day is found to be a numerical valued random phenomenon, with a probability function specified by the probability density function f(x) is given by

$$f(x) = \begin{cases} Ax, & for\ 0 \le x < 10 \\ A(20-x), & for\ 10 \le x < 20 \\ 0, & otherwise \end{cases}$$

(a) Find the value of A. (b) What is the probability that the number of pounds of bread that will be sold tomorrow is (i) More than 10 pounds, (ii) Less than 10 pounds, and (iii)Between 5 and 15 pounds?

[OR]

45(b). Evaluate the integral as the limit of a sum $\int_1^2 (2x+1)dx$

46(a). Two types of soaps A and B are in the market. Their present market shares are 15%for A and 85% for B. Of those who bought A the previous year, 65% continue to buy it again while 35% switch over to B. Of those who bought B the previous year, 55% buy it again and 45% switch over to A. Find their market shares after one year and when is the equilibrium reached?

[OR]

46(b) solve : $(D^2 + D - 6)\ y = e^{3x} + e^{-3x}$

47(a) . The population of a city in a censes taken once in 10 years is given below. Estimate the population in the year 1955

Year	1951	1961	1971	1981
Population in lakhs	35	42	58	84

[OR]

47(b). Under perfect competition for a commodity the demand and supply laws are $p_d = \frac{8}{x+1} - 2$ and $p_s = \frac{x+3}{2}$ respectively. Find the consumer's and producer's surplus