QB365 Student Learing Managemnet System
Exam Name: Pre Quarterly - Practice
Std: 12th Standard - Business Maths and Statistics
Chapter: Applications of Matrices and Determinants, Integral Calculus – I, Integral Calculus – II, Random Variable and Mathematical Expectation, Probability Distributions, Sampling Techniques and Statistical Inference, Applied Statistics, Differential Equations, Operations Research, Numerical Methods

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Questions:

5 Marks

1. An amount of Rs. 5,000/- is to be deposited in three different bonds bearing 6%, 7% and 8% per year respectively. Total annual income is Rs. 358/-. If the income from first two investments is Rs. 70/- more than the income from the third, then find the amount of investment in each bond by rank method.
2. Solve the equations x + 2y + z = 7, 2x − y + 2z = 4, x + y − 2z = −1 by using Cramer's rule
3. Evaluate $\int \frac{3x^2+6x+1}{(x+3)(x^2+1)}dx$
4. A firm has the marginal revenue function given by MR = $\frac{a}{(x+b)^2}$ - c where x is the output and a, b, c are constants. Show that the demand function is given by $x = \frac{a}{b(p+c)} - b$.
5. 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

$$f(x) = \begin{cases} Ax, for\ 0 \le x10 \\ A(20-x), for\ 10 \le x < 20 \\ 0, \qquad otherwise \end{cases}$$

(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?

6. Elasticity of a function $\frac{Ey}{Ex}$ is given by $\frac{Ey}{Ex} = \frac{-7x}{(1-2x)(2+3x)}$. Find the function when x = 2, y = $\frac{3}{8}$.
7. The probability density function of a random variable X is f(x) = $ke^{-|x|}$, $-\infty < x < \infty$ Find the value of k and also find mean and variance for the random variable.
8. Out of 750 families with 4 children each, how many families would be expected to have
(i) atleast one boy
(ii) atmost 2 girls
(iii) and children of both sexes? Assume equal probabilities for boys and girls.
9. Evaluate the following integrals as the limit of the sum:
$\int_0^1 x^2 dx$
10. The mean breaking strength of cables supplied by a manufacturer is 1,800 with a standard deviation 100. By a new technique in the manufacturing process it is claimed that the breaking strength of the cables has increased. In order to test this claim a sample of 50 cables is tested. It is found that the mean breaking strength is 1,850. Can you support the claim at 0.01 level of significance.
11. Given below are the data relating to the production of sugarcane in a district.
Fit a straight line trend by the method of least squares and tabulate the trend values.

Year	2000	2001	2002	2003	2004	2005	2006
Prod.of Sugarcane	40	45	46	42	47	50	46

12. Suppose that the quantity demanded Q_d = 13 - 6P + 2$\frac{dp}{dt} + \frac{d^2p}{dt^2}$ and quantity supplied Q_s = − 3 + 2p, where p is the price. Find the equilibrium price for market clearance.
13. A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimates of the time each man would take to perform each task is given below :

Subordinates	Tasks 1	2	3	4
P	8	26	17	11
Q	13	28	4	26
R	38	19	18	15
S	9	26	24	10

How should the tasks be allocated to subordinates so as to minimize the total man-hours?

14. Estimate the production for 1964 and 1966 from the following data

Year	1961	1962	1963	1964	1965	1966	1967
Production	200	220	260	-	350	-	430

3 Marks

15. Find the rank of the matrix $\begin{pmatrix} 1 & 2 & -1 & 3 \\ 2 & 4 & 1 & -2 \\ 3 & 6 & 3 & -7 \end{pmatrix}$
16. 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?
17. If f '(x) = $8x^3$ - 2x and f(2) = 8, then find f(x)
18. The discrete random variable X has the following probability function $P(X=x) = \begin{cases} kx & x = 2,4,6 \\ k(x-2), & x = 8 \\ 0, & \text{otherwise} \end{cases}$ where k is a constant. Show that k = $\frac{1}{18}$
19. The demand function for a commodity is p = e^{-x}. Find the consumer's surplus when p = 0.5.
20. What is the probability of guessing correctly atleast six of the ten answers in a TRUE/FALSE objective test?

21. Evaluate $\int_0^{\frac{\pi}{2}} x \sin x \, dx$

22. Given $U_0 = 1$, $U_1 = 11$, $U_2 = 21$, $U_3 = 28$ and $U_4 = 29$ find $\Delta^4 U_0$

23. Find the differential equation of the following
$y = c(x - c)^2$

24. Evaluate $\int \frac{dx}{\sqrt{3x+4} - \sqrt{3x+1}}$

2 Marks

25. Evaluate $\int \left(e^x + \frac{1}{e^x}\right)^2 dx$

26. The 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.

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

28. What are the properties of Mathematical expectation?

29. Write any 2 examples for Poisson distribution.

30. State the two normal equations used in fitting a straight line.

31. Evaluate the following
$\int_0^\infty e^{-4x} x^4 dx$

32. Find the missing term from the following data

x	1	2	3	4
f(x)	100	-	126	157

33. Find the order and degree of the following differential equation
$y' + (y'')^2 = (x + y'')^2$

34. Evaluate Δ (log ax).

Multiple Choice Question

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

36. Cramer's rule is applicable only to get an unique solution when _____.
(a) $\triangle_z \neq 0$ (b) $\triangle_x \neq 0$ (c) $\triangle \neq 0$ (d) $\triangle_y \neq 0$

37. Area bounded by the curve y = $\frac{1}{x}$ between the limits 1 and 2 is _____.
(a) log 2 sq.units (b) log 5 sq.units (c) log 3 sq.units (d) log 4 sq.units

38. Area bounded by y = $|x|$ between the limits 0 and 2 is _____.
(a) 1sq.units (b) 3 sq.units (c) 2 sq.units (d) 4 sq.units

39. If c is a constant, then E(c) is _____.
(a) 0 (b) 1 (c) c f (c) (d) c

40. The probability function of a random variable is defined as

X=x	-1	-2	0	1	2
P(x)	K	2K	3K	4K	5K

Then k is equal to _____.
(a) zero (b) $\frac{1}{4}$ (c) $\frac{1}{15}$ (d) one

41. If X ~ N(9,81) the standard normal variate Z will be _____.
(a) $Z = \frac{X-81}{9}$ (b) $Z = \frac{X-9}{81}$ (c) $Z = \frac{X-9}{9}$ (d) $Z = \frac{9-X}{9}$

42. Which of the following statements is/are true regarding the normal distribution curve?
(a) it is symmetrical and bell shaped curve (b) it is asymptotic in that each end approaches the horizontal axis but never reaches it
(c) its mean, median and mode are located at the same point (d) all of the above statements are true.

43. $\int \frac{\sin 5x - \sin x}{\cos 3x} dx$ is _____.
(a) –cos 2x + c (b) -cos 2x + c (c) $-\frac{1}{4}$cos2x + c (d) -4cos2x + c

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

45. A _____ of statistical individuals in a population is called a sample.
(a) Infinite set (b) finite subset (c) finite set (d) entire set

46. The standard error of sample mean is _____.
(a) $\frac{\sigma}{\sqrt{2n}}$ (b) $\frac{\sigma}{n}$ (c) $\frac{\sigma}{\sqrt{n}}$ (d) $\frac{\sigma^2}{\sqrt{n}}$

47. The value of 'b' in the trend line y = a + bx is _____.
(a) Always positive (b) Always negative (c) Either positive or negative (d) Zero

48. A typical control charts consists of _____.
(a) CL, UCL (b) CL, LCL (c) CL, LCL, UCL (d) UCL, LCL

49. If $\sec^2 x$ is an integrating factor of the differential equation $\frac{dy}{dx}$ + Py Q then P = _____.
(a) 2 tan x (b) sec x (c) $\cos^2 x$ (d) $\tan^2 x$

50. A homogeneous differential equation of the form $\frac{dy}{dx} = f\left(\frac{y}{x}\right)$ can be solved by making substitution, _____.
(a) y = v x (b) v = y x (c) x = v y (d) x = v

51. The transportation problem is said to be unbalanced if _____.
(a) Total supply ≠ Total demand (b) Total supply = Total demand (c) m = n (d) m+n–1

52. In an assignment problem involving four workers and three jobs, total number of assignments possible are _____.

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(a) 4 (b) 3 (c) 7 (d) 12

53. 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) $\Delta^{m-n} f(x)$

54. For the given points (x_0, y_0) and (x_1, y_1) the Lagrange's formula is _____.

(a) $y(x) = \frac{x-x_1}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$ (b) $y(x) = \frac{x_1-x}{x_0-x_1}y_0 + \frac{x-x_0}{x_1-x_0}y_1$ (c) $y(x) = \frac{x-x_1}{x_0-x_1}y_1 + \frac{x-x_0}{x_1-x_0}y_0$ (d) $y(x) = \frac{x_1-x}{x_0-x_1}y_1 + \frac{x-x_0}{x_1-x_0}y_0$

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