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, Differential Equations, Applied Statistics, Operations Research, Numerical Methods

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Questions:

5 Marks

1. 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 have
   (i) no solution
   (ii) a unique solution
   (iii) an infinite number of solutions.

2. Two products A and B currently share the market with shares 50% and 50% each respectively. Each week some brand switching takes place. Of those who bought A the previous week, 60% buy it again whereas 40% switch over to B. Of those who bought B the previous week, 80% buy it again where as 20% switch over to A. Find their shares after one week and after two weeks. If the price war continues, when is the equilibrium reached?

3. The marginal cost C′(x) and marginal revenue R′(x) are given by C′(x) = 50 + $\frac{x}{50}$ and R′(x) = 60. The fixed cost is Rs. 200. Determine the maximum profit

4. A continuous random variable X has the following probability function

Value of X = x	0	1	2	3	4	5	6	7
P(x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2+k$

   (i) Find k
   (ii) Ealuate p(x<6), p(x≥6) and p(0)
   (iii) If P(X≤x). $\frac{1}{2}$, then find the minimum value of x.

5. The demand equation for a product is p_d = 20 - 5x and the supply equation is p_s = 4x + 8. Determine the consumer's surplus and producer's surplus under market equilibrium.

6. The average number of customers, who appear in a counter of a certain bank per minute is two. Find the probability that during a given minute
   (i) No customer appears
   (ii) three or more customers appear

7. If the heights of 500 students are normally distributed with mean 68.0 inches and standard deviation 3.0 inches , how many students have height
   (a) greater than 72 inches
   (b) less than or equal to 64 inches
   (c) between 65 and 71 inches

8. Evaluate the integral as the limit of a sum: $\int_1^2 x^2\,dx$

9. Calculate the seasonal index for the quarterly production of a product using the method of simple averages.

Year	I Quarter	II Quarter	III Quarter	IV Quarter
2005	255	351	425	400
2006	269	310	396	410
2007	291	332	358	395
2008	198	289	310	357
2009	200	290	331	359
2010	250	300	350	400

10. Solve $3e^x\tan y\,dx + (1 + e^x)\sec^2 y\,dy = 0$ given y(0) = $\frac{\pi}{4}$

11. The marginal revenue 'y' of output 'q' is given by the equation $\frac{dy}{dq} = \frac{q^2+3y^2}{2qy}$. Find the total Revenue function when output is 1 unit and Revenue is Rs. 5.

12. Calculate Fisher's index number to the following data. Also show that it satisfies Time Reversal Test.

Commodity	Price in Rupees per unit		Number of units	
	Price (Rs.)	Quantity (Kg)	Price (Rs.)	Quantity (Kg)
Food	40	12	65	14
Fuel	72	14	78	20
Clothing	36	10	36	15
Wheat	20	6	42	4
Others	46	8	52	6

13. Obtain an initial basic feasible solution to the following transportation problem using Vogel's approximation method.

Ware houses	Stores I	II	III	IV	Availability (a_i)
A	5	1	3	3	34
B	3	3	5	4	15
C	6	4	4	3	12
D	4	1	4	5	19
Requirement (b_j)	21	25	17	17	

14. Evaluate $\Delta\left[\frac{5x+12}{x^2+5x+6}\right]$ by taking '1' as the interval of differencing.

3 Marks

15. Show that the equations 3x – 2y = 6, 6x – 4y = 10 are inconsistent

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

17. Evaluate $\int \frac{1}{\sqrt{x+2}-\sqrt{x-2}}dx$

18. Consider a random variable X with probability density function $f(x) = \begin{cases} 4x^3 & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$

Find E(X) and V(X).

19. The mean of Binomials distribution is 20 and standard deviation is 4. Find the parameters of the distribution.

20. Solve $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$

21. Calculate the cost of living index by aggregate expenditure method:

Commodity	Weights 2010	Price (Rs.)	
		2010	2015
P	80	22	25
Q	30	30	45
R	25	42	50
S	40	25	35
T	50	36	52

22. Consider the following pay-off matrix

Alternative	Pay – offs (Conditional events)			
	A_1	A_2	A_3	A_4
E_1	7	12	20	27
E_2	10	9	10	25
E_3	23	20	14	23
E_4	32	24	21	17

Using minmax principle, determine the best alternative.

23. By constructing a difference table and using the second order differences as constant, find the sixth term of the series 8,12,19,29,42...

24. Evaluate : $\int_0^{\frac{\pi}{2}} \frac{1}{1+\cot x}dx$

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2 Marks

25. Evaluate $\int \sqrt{1+\sin 2x}\, dx$

26. Find the area of the region bounded by the parabola $y = 4 - x^2$, x -axis and the lines x = 0, x = 2.

27. Suppose, the life in hours of a radio tube has the following p.d.f

$f(x) = \begin{cases} \frac{100}{x^2}, & \text{when } x \geq 100 \\ 0, & \text{when } x < 100 \end{cases}$

Find the distribution function.

28. In tossing of a five fair coin, find the chance of getting exactly 3 heads.

29. Find the differential equation of the following

$y = cx + c - c^3$

30. State the uses of time series.

31. What is transportation problem?

32. Evaluate $\Delta^2\left(\frac{1}{x}\right)$ by taking '1' as the interval of differencing.

33. Find the rank of each of the following matrices.

$\begin{pmatrix} 1 & 4 \\ 2 & 8 \end{pmatrix}$

34. If $f'(x) = 8x^3 - 2x^2$, f(2) = 1, find f(x)

Multiple Choice Question

35. If the rank of the matrix $\begin{pmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{pmatrix}$ is 2. Then λ is _____.

(a) 1 (b) 2 (c) 3 (d) only real number

36. Which of the following is not an elementary transformation?

(a) $R_i \leftrightarrow R_j$ (b) $R_i \rightarrow 2R_i + 2C_j$ (c) $R_i \rightarrow 2R_i - 4R_j$ (d) $C_i \rightarrow C_i + 5C_j$

37. If MR and MC denotes the marginal revenue and marginal cost functions, then the profit functions is _____.

(a) $P = \int (MR - MC)\, dx + k$ (b) $P = \int (MR + MC)\, dx + k$ (c) $P = \int (MR)(MC) dx + k$ (d) $P = \int (R - C) dx + k$

38. Area bounded by $y = e^x$ between the limits 0 to 1 is _____.

(a) (e -1) sq.units (b) (e +1) sq.units (c) $\left(1 - \frac{1}{e}\right)$sq.units (d) $\left(1 + \frac{1}{e}\right)$sq.units

39. Which of the following is not possible in probability distribution?

(a) $\sum p(x) \geq 0$ (b) $\sum p(x) = 1$ (c) $\sum xp(x) = 2$ (d) $p(x) = -0.5$

40. If p(x) = $\frac{1}{10}$, c = 10, then E(X) is _____.

(a) zero (b) $\frac{6}{8}$ (c) 1 (d) -1

41. If X ~ N(μ, σ^2), the maximum probability at the point of inflexion of normal distribution is _____.

(a) $\left(\frac{1}{\sqrt{2\pi}}\right)e^{\frac{1}{2}}$ (b) $\left(\frac{1}{\sqrt{2\pi}}\right)e^{\left(-\frac{1}{2}\right)}$ (c) $\left(\frac{1}{\sigma\sqrt{2\pi}}\right)e^{\left(\frac{1}{2}\right)}$ (d) $\left(\frac{1}{\sqrt{2\pi}}\right)$

42. In a binomial distribution, the probability of success is twice as that of failure. Then out of 4 trials, the probability of no success is _____.
(a) 16/81 (b) 1/16 (c) 2/27 (d) 1/81

43. $\int_{-1}^{1} x^3 e^{x^4}$ dx is _____.
(a) 1 (b) $2\int_{-1}^{1} x^3 e^{x^4}$ dx (c) 0 (d) e^{x^4}

44. $\Gamma(n)$ is _____.
(a) (n -1)! (b) n! (c) $n\Gamma(n)$ (d) (n -1)Γ(n)

45. A random sample is a sample selected in such a way that every item in the population has an equal chance of being included _____.
(a) Harper (b) Fisher (c) Karl Pearson (d) Dr. Yates

46. Type I error is _____.
(a) Accept H_0 when it is true (b) Accept H_0 when it is false (c) Reject H_0 when it is true (d) Reject H_0 when it is false.

47. The additive model of the time series with the components T, S, C and I is _____.
(a) y = T + S + C × I (b) y = T + S × C × I (c) y = T + S + C + I (d) y = T + S × C + I

48. Laspeyre's index = 110, Paasche's index = 108, then Fisher's Ideal index is equal to: _____.
(a) 110 (b) 108 (c) 100 (d) 109

49. The differential equation $\left(\frac{dx}{dy}\right)^3 + 2y^{\frac{1}{7}}$ = x is _____.
(a) of order 2 and degree 1 (b) of order 1 and degree 3 (c) of order 1 and degree 6 (d) of order 1 and degree 2

50. The complementary function of $(D^2 + 4)y = e^{2x}$ is _____.
(a) $(Ax + B)e^{2x}$ (b) $(Ax + B)e^{-2x}$ (c) A cos 2x + B sin 2x (d) $Ae^{-2x} + Be^{2x}$

51. In a non – degenerate solution number of allocations is _____.
(a) Equal to m+n–1 (b) Equal to m+n+1 (c) Not equal to m+n–1 (d) Not equal to m+n+1

52. A type of decision –making environment is _____.
(a) certainty (b) uncertainty (c) risk (d) all of the above

53. If c is a constant then Δc = _____.
(a) c (b) Δ (c) Δ^2 (d) 0

54. Lagrange's interpolation formula can be used for _____.
(a) equal intervals only (b) unequal intervals only (c) both equal and unequal intervals (d) none of these.

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