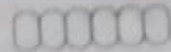


V12BM

Virudhunagar District  
Second Revision Examination - 2024

Standard - 12

## BUSINESS MATHEMATICS &amp; STATISTICS

Time Allowed: 3.00 Hours

Maximum Marks: 90

I. Choose the best answer:

20 × 1 = 20

- If  $A = \begin{bmatrix} 2 & 0 \\ 0 & 8 \end{bmatrix}$ , then  $\rho(A)$  is
  - 0
  - 1
  - 2
  - n
- If  $|A| = 0$ , then A is
  - non-singular matrix
  - singular matrix
  - zero matrix
  - none of these
- $\int \frac{e^x}{\sqrt{1+e^x}} dx$  is
  - $\frac{e^x}{\sqrt{1+e^x}} + C$
  - $2\sqrt{1+e^x} + C$
  - $\sqrt{1+e^x} + C$
  - $e^x \sqrt{1+e^x} + C$
- The value of  $\int_1^5 f(5-x)dx - \int_1^5 f(x)dx$  is
  - 1
  - 0
  - 1
  - 5
- Area bounded by the curve  $y = \frac{1}{x}$  between the limits 1 and 2 is
  - log 2 sq. units
  - log 5 sq. units
  - log 3 sq. units
  - log 4 sq. units
- The area bounded by the parabola  $y^2 = 4x$  bounded by its latus rectum is
  - $\frac{16}{3}$  sq. units
  - $\frac{8}{3}$  sq. units
  - $\frac{72}{3}$  sq. units
  - $\frac{1}{3}$  sq. units
- The integrating factor of the differential equation  $\frac{dy}{dx} + Py = Q$  is
  - $e^{\int P dx}$
  - $\int P dx$
  - $\int P dy$
  - $e^{\int P dy}$
- The P.I of  $(3D^2 + D - 14)y = 13e^{2x}$  is
  - $\frac{x}{2} e^{2x}$
  - $x e^{2x}$
  - $\frac{x^2}{2} e^{2x}$
  - $13x e^{2x}$
- $\Delta^2 y_0 =$ 
  - $y_2 - 2y_1 + y_0$
  - $y_2 + 2y_1 - y_0$
  - $y_2 + 2y_1 + y_0$
  - $y_2 + y_1 + 2y_0$
- If  $f(x) = x^2 + 2x + 2$  and the interval of differencing is unity then  $\Delta f(x)$ 
  - $2x - 3$
  - $2x + 3$
  - $x + 3$
  - $x - 3$
- $E[X - E(X)]^2$  is
  - $E(X)$
  - $E(X^2)$
  - $V(X)$
  - $SD(X)$
- A discrete probability function  $P(X)$  is always
  - non-negative
  - negative
  - one
  - zero
- If  $X \sim N(9, 81)$  the standard normal variate Z will be
  - $Z = \frac{X - 81}{9}$
  - $Z = \frac{X - 9}{81}$
  - $Z = \frac{X - 9}{9}$
  - $Z = \frac{9 - X}{9}$

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14. If  $P(Z > z) = 0.5832$ . What is the value of  $z$  (z has a standard normal distribution)?  
 a) -0.48      b) 0.48      c) 1.04      d) -0.21
15. A finite subset of statistical individuals in a population is called \_\_\_\_\_.  
 a) a sample      b) a population      c) universe      d) census
16. The standard error of sample mean is  
 a)  $\frac{\sigma}{\sqrt{2n}}$       b)  $\frac{\sigma}{n}$       c)  $\frac{\sigma}{\sqrt{n}}$       d)  $\frac{\sigma^2}{\sqrt{n}}$
17. If  $P_{01}^i = 256$ ,  $P_{01}^p = 169$ , then  $P_{01}^r =$   
 a) 256      b) 169      c) 225      d) 208
18. The LCL for R chart is given by  
 a)  $D_2 \bar{R}$       b)  $D_2 \bar{R}$       c)  $D_3 \bar{R}$       d)  $D_3 \bar{R}$
19. 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  $m + n + 1$
20. In an assignment problem the value of decision variable  $x_{ij}$  is \_\_\_\_\_.  
 a) 1      b) 0      c) 1 or 0      d) none of them

**II. Answer any seven of the following.**  
**Question Number. 30 is compulsory.**

7×2=14

21. Evaluate :  $\int \frac{2}{3x+5} dx$ .
22. If the marginal revenue function is  $R'(x) = 1500 - 4x - 3x^2$ . Find the revenue function and average revenue function.
23. Find the differential equation of the family of all straight lines passing through the origin.
24. Find  $\Delta \log x$ .
25. If  $p(x) = \begin{cases} \frac{x}{20}, & x=0,1,2,3,4,5 \\ 0 & \text{otherwise} \end{cases}$ , find (i)  $p(x < 3)$  (ii)  $p(2 < x \leq 4)$ .
26. Write the conditions for which the poisson distribution is a limiting case of binomial distribution.
27. Mention two branches of statistical inference.
28. Mention the components of the time series.
29. Obtain an initial basic feasible solution to the following, transportation problem by using least cost method.

	$D_1$	$D_2$	$D_3$	supply
$O_1$	9	8	5	25
$O_2$	6	8	4	35
$O_3$	7	6	9	40
Demand	35	25	45	

30. 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.

**III. Answer any seven of the following.**  
**Question Number. 40 is compulsory.**

7×3=21

31. If  $A = \begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$ , then find the rank of AB.

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32. Evaluate :  $\int x^3 e^{x^2} dx$ .
33. Find the area bounded by the lines  $y - 2x - 4 = 0$ ,  $y = 1$ ,  $y = 3$  and  $y$  - axis.
34. Solve  $\frac{d^2y}{dx^2} - 6 \frac{dy}{dx} + 8y = 0$ .
35. 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  $V(X)$ .
36. The probability that a student get the degree is 0.4. Determine the probability that out of 5 students (i) one will be graduate (ii) atleast one will be graduate.
37. State any three merits of stratified random sampling.
38. A machine drills hole in a pipe with a mean diameter of 0.532 cm and a standard deviation of 0.002 cm. Calculate the control limits for mean of samples 5.
39. Given the following pay-off matrix (in rupees) for three strategies and two states of nature.

Strategy	States of nature	
	$E_1$	$E_2$
$S_1$	40	60
$S_2$	10	-20
$S_3$	-40	150

- Select a strategy using each of the following rule (i) Maximum (ii) Minimax.
40. From the following table find the missing value.

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

#### IV. Answer all the questions.

7×5=35

41. a) 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 whereas 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?

(OR)

- b) Construct the distribution function for the discrete random variable  $X$  whose probability distribution is given below. Also draw a graph of  $P(x)$  and  $F(x)$ .

$x = x$	1	2	3	4	5	6	7
$p(x)$	0.10	0.12	0.20	0.30	0.15	0.08	0.05

42. a) Evaluate :  $\int \frac{3x^2 + 6x + 1}{(x+3)(x^2+1)} dx$ .

(OR)

- b) In a test on 2000 electric bulbs, it was found that bulbs of a particular make, was normally distributed with an average life of 2040 hours and standard deviation of 60 hours. Estimate the number of bulbs likely to burn for (i) more than 2150 hours (ii) less than 1950 hours (iii) more 1920 hours but less than 2100 hours.

43. a) 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 ₹ 200. Determine the maximum profit.

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(OR)

b) The wages of the factory workers are assumed to be normally distributed with mean and variance 25. A random sample of 50 workers gives the total wages equal to ₹ 2550. Test the hypothesis  $\mu = 52$ , against the alternative hypothesis  $\mu = 49$  at 1% level of significance.

44. a) Solve :  $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ .

(OR)

b) 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

45. a) Show that the equations  $x + y + z = 6$ ,  $x + 2y + 3z = 14$ ,  $x + 4y + 7z = 30$  are consistent and solve them.

(OR)

b) The population of a city in a census 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

46. a) Evaluate :  $\int_0^{\pi/2} \frac{\sin^7 x}{\sin^7 x + \cos^7 x} \, dx$ .

(OR)

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

		Job				
		1	2	3	4	5
Person	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

47. a) The demand and supply function of a commodity are  $P_d = 18 - 2x - x^2$  and  $P_s = 2x - 3$ . Find the consumer's surplus and producer's surplus at equilibrium price.

(OR)

b) Calculate the cost of living index number for the following data.

Commodities	Quantity	Price (Rs)	
	2005	2005	2010
A	10	7	9
B	12	6	8
C	17	10	15
D	19	14	16
E	15	12	17