

**Class : 12**Register  
Number**UNIT TEST-1, JULY - 2024****BUSINESS MATHEMATICS  
AND STATISTICS**

Time Allowed : 1.30 Hours]

[Max. Marks : 50

## Part - I

1. Answer all the questions by choosing the correct answer from the given 4 alternatives.
2. Write question number, correct option and corresponding answer
3. Each question carries 1 mark. 10x1=10

1. If  $A = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$  then the rank of  $AA^T$  is  
 (a) 0 (b) 1 (c) 2 (d) 3
2. The rank of the unit matrix of order 3 is  
 (a) 2 (b) 3 (c) 4 (d)  $3^2$
3. If  $T = \begin{matrix} A & \begin{pmatrix} 0.8 & 0.2 \\ 0.4 & x \end{pmatrix} \end{matrix}$  is a transition probability matrix, then the value of x is  
 (a) 0.2 (b) 0.4 (c) 0.6 (d) 0.8
4. If the rank of the matrix  $\begin{pmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{pmatrix}$  is 2. Then  $\lambda$  is  
 (a) 1 (b) 2 (c) 3 (d) only real number
5.  $|A_{n \times n}| = 3$   $|\text{adj}A| = 243$  then the value n is  
 (a) 4 (b) 5 (c) 6 (d) 7
6.  $\int \frac{1}{x^2} dx$  is  
 (a)  $\frac{-3}{x^2} + c$  (b)  $\frac{-1}{2x^2} + c$  (c)  $\frac{-1}{3x^2} + c$  (d)  $\frac{-2}{x^2} + c$
7.  $\int \sqrt{e^x} dx$  is  
 (a)  $\sqrt{e^x} + c$  (b)  $2\sqrt{e^x} + c$  (c)  $\frac{1}{2}\sqrt{e^x} + c$  (d)  $\frac{1}{2\sqrt{e^x}} + c$
8.  $\int_0^{\infty} x^4 e^{-x} dx$  is  
 (a) 12 (b) 4 (c) 4! (d) 64
9.  $\Gamma\left(\frac{3}{2}\right)$   
 (a)  $\sqrt{\pi}$  (b)  $\frac{\sqrt{\pi}}{2}$  (c)  $2\sqrt{\pi}$  (d)  $\frac{3}{2}$
10.  $\int_0^1 (2x + 1) dx$  is  
 (a) 1 (b) 2 (c) 3 (d) 4

## PART - II

1. Answer any 4 questions: 2. Each question carries 2 marks:
3. Question number 16 is compulsory: 4x2=8
11. Find the rank of the matrix  $\begin{pmatrix} 1 & -1 \\ 3 & -6 \end{pmatrix}$

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12. Show that the equations  $x + y = 5$ ,  $2x + y = 8$  are consistent and solve them
13. Solve the equations  $2x + 3y = 7$ ,  $3x + 5y = 9$  by Cramer's rule
14. Evaluate  $\int \frac{dx}{(2x+3)^2}$
15. Evaluate  $\int_0^{\infty} e^{-2x} x^3 dx$
16. Evaluate  $\int [e^{2x} + e^{-x}]^3 dx$

## PART - III

1. Answer any 4 questions. 2. Each question carries 3 marks
3. Question number 22 is compulsory 4x3=12

17. Find the rank of the matrix  $\begin{pmatrix} -2 & 1 & 3 & 4 \\ 0 & 1 & 1 & 2 \\ 1 & 3 & 4 & 7 \end{pmatrix}$

18. A total of ₹ 8,600 was invested in two accounts. One account earned  $4\frac{1}{4}\%$  annual interest and the other earned  $6\frac{1}{2}\%$  annual interest. If the total interest for one year was ₹ 431.25, how much was invested in each account? (Use determinant method).
19. Show that the equations  $x - 4y + 7z = 14$ ,  $3x + 8y - 2z = 13$ ,  $7x - 8y + 26z = 5$  are inconsistent.
20. Evaluate  $\int x^2 e^x dx$
21.  $f(x) = \begin{cases} cx, & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$  Find 'c' if  $\int_0^1 f(x) dx = 2$ .
22. Evaluate  $\int \frac{4ax+2b}{ax^2+bx+c} dx$

## PART - IV

1. Answer all the questions. 2. Each question carries 5 marks 4x5=20

23. a) Solve the following system of equations by rank method  $x+y+z=9$ ,  $2x+5y+7z=52$ ,  $2x-y-z=0$ .

(OR)

- b) Solve by Cramer's rule  $x + y + z = 4$ ,  $2x - y + 3z = 1$ ,  $3x + 2y - z = 1$
24. 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) Find k, if the equations  $x + 2y - 3z = -2$ ,  $3x - y - 2z = 1$ ,  $2x + 3y - 5z = k$  are consistent.
25. a) Evaluate  $\int \frac{4x^2+2x+6}{(x+1)^2(x-3)} dx$

(OR)

- b) Evaluate  $\int (\log x)^2 dx$
26. a) Evaluate  $\int_0^{\pi/2} \frac{\sin^7 x}{\sin^7 x + \cos^7 x} dx$

(OR)

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