

Roll No.....

Total No. of Questions : 31]

[Total No. of Printed Pages : 8

12thARF(S/Z)JD-2026

1429

BUSINESS MATHEMATICS

Time : 3 Hours]

[Maximum Marks : 80

SECTION-A

(Objective Type Questions)

1. The order of the differential equation : (1 mark each)

$$2x^2 \frac{d^2y}{dx^2} - 3 \frac{dy}{dx} + y = 0$$

(a) 2

(b) 1

(c) 0

(d) None of these

2. $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} =$

(a) 1

(b) e

(c) 0

(d) None of these

3. $\int \sin x \, dx$ is equal to

(a) $\cos x + C$

(b) $-\cos x + C$

(c) $\sec x + C$

(d) None of these

4. If 'f' is a real function on a subset of the real numbers and c is a point in the domain of f. then 'f' is continuous at 'c' if

(a) $\lim_{x \rightarrow c} f(x) = n$

(b) $\lim_{x \rightarrow c} f(x) = 1$

(c) $\lim_{x \rightarrow c} f(x) = f(c)$

(d) None of these

5. $\int \frac{dx}{x^2 + a^2} =$

(a) $\frac{1}{a} \tan^{-1} \frac{x}{a} + c$

(b) $\frac{1}{2a} \tan^{-1} \frac{x}{a} + c$

(c) $\tan^{-1} \frac{x}{a} + c$

(d) None of these

6. Computers cannot be truly original, invent or possess human like imagination. (True/False)
7. If $C(x)$ represents the total cost function for producing x units, the Average cost ($AC(x)$) is calculated as $AC(x) = \frac{C(x)}{x}$. (True/False)
8. Computers are crucial for managing on line transactions, banking and e-commerce. (True/False)
9. The total cost in rupees received from the sale of x units of a product is given by $C(x) = 3x^2 + 36x + 5$. The Marginal cost, when $x = 5$ is
- (a) 60 (b) 66
- (c) 62 (d) None of these
10. The general solution of the differential equation $\frac{dy}{dx} = e^{x-y}$ is
- (a) $e^x + e^{-y} = C$ (b) $e^{-x} + e^{-y} = C$
- (c) $e^{-x} + e^y = C$ (d) None of these

SECTION-B**(Very Short Answer Type Questions)****(2 marks each)**

11. Find $\int (2x^2 - 3\sin x + 5\sqrt{x}) dx$.

12. Find $A + B$, where

$$A = \begin{bmatrix} \cos^2 x & \sin^2 x \\ \sin^2 x & \cos^2 x \end{bmatrix} \text{ and } B = \begin{bmatrix} \sin^2 x & \cos^2 x \\ \cos^2 x & \sin^2 x \end{bmatrix}$$

13. Find the limit

$$\lim_{x \rightarrow 0} \frac{x^3 - 2x^2}{x^2 - 5x + 6}$$

14. Find the derivative of $y = \tan(2x + 3)$.

15. Verify that the function $y = e^{-3x}$ is a solution of the differential

equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 6y = 0$.

16. Find the $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$

17. Define a computer algorithm and explain its importance in solving everyday problems.

18. Evaluate $\int \frac{1}{x(\log x)^m} dx, x > 0$

19. The price of a commodity is fixed at ₹ 50 and its cost function is

$C(x) = 3x + 94$. Determine the breakeven point.

20. Find the limit :

$\lim_{x \rightarrow 0} \frac{\sin ax + b}{ax + \sin bx}, a, b \neq 0$

SECTION-C

(Short Answer Type Questions): (4 marks each)

21. Solve the differential equation : $\frac{dy}{dx} = \frac{1 - \cos x}{1 + \cos x}$

22. Evaluate the definite integral $\int_2^3 x^2 dx$ as limit of sum.

23. Solve the differential equation :

$$\frac{dy}{dx} + 2y = \sin x$$

24. Find x and y , If $x + y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$, $x - y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$

25. Evaluate :

$$\int_{-1}^2 |x^3 - x| dx$$

26. Find $\frac{dy}{dx}$, Where $2x + 3y = \sin x$

27. Write a step-by step algorithm to find the least common multiple (L.C.M) of two numbers.

28. A firm has the total cost and demand function

$$C(x) = \frac{x^3}{3} - 7x^2 + 111x + 50,$$

$$x = 100 - p$$

Find the profit maximising output.

SECTION-D

(Long Answer Type questions)

(6 marks each)

29. Using first principle, find derivative of $\log x$.

Or

Find the derivative of $f(x) = \frac{\sin(ax + b)}{\cos(cx + d)}$ for fixed constants a, b, c and d .

30 Evaluate

$$\int \frac{x^2}{(x^2 + 1)(x^2 + 4)} dx.$$

Or

Evaluate $\int x \sin 3x \, dx$.

31. Using property of determinants,

Prove that $\begin{vmatrix} x & a & x+a \\ y & b & y+b \\ z & c & z+c \end{vmatrix} = 0$

Or

Solve the following system of equations by matrix method

$$x - y + 2z = 7$$

$$3x + 4y - 5z = -5$$

$$2x - y + 3z = 12$$