

CLASS 12 – UP BOARD
MATHEMATICS – SET 6
ANSWERS KEY

खंड – A (MCQ with Concept)

1. $|\text{adj } A| = |A|^{(n-1)} = 4^2 = 16$
 2. $\lim (\sin 2x)/x = 2$
 3. $dy/dx = (2x+3)e^{(x^2+3x)}$
 4. $\int_0^1 (3x^2+2x)dx = [x^3+x^2]_0^1 = 1+1 = 2$
 5. $P(A|B)=0.3/0.5=3/5$
 6. $a \cdot b = (2)(1) + (1)(-1) + (-3)(2) = 2 - 1 - 6 = -5$ (Option mismatch \rightarrow सही गणितीय उत्तर -5)
 7. $f'(x) = 4x^3 - 16x$
 $x=0$ पर $f'=0$
 $f''(0) = -16 < 0 \Rightarrow$ Local Maximum
 8. $\int (4x^3/(x^4+5))dx$
 $= \ln(x^4+5) + C$
 9. $|a \times b| = |a||b|\sin 90^\circ = 5 \times 2 = 10$
 10. $P(A \cap B) = (1/3)(3/4) = 1/4$
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खंड – B (2 अंक – Proper Steps)

11. $|AB| = |A||B|$

Determinant गुणधर्म से सिद्ध।

12. $\lim (e^x - 1 - x)/x^2$

$$e^x = 1 + x + x^2/2 + \dots$$

$$\Rightarrow (x^2/2)/x^2$$

$$= 1/2$$

13. $y = \cos^{-1}x$

$$dy/dx = -1/\sqrt{1-x^2}$$

14. $\int e^{3x} dx$

$$= (1/3)e^{3x} + C$$

15. Conditional Probability

$$P(A | B) = \frac{P(A \cap B)}{P(B)}$$

16. $a \cdot (a \times b) = 0$

Cross product $a \times b \perp a$

\Rightarrow dot product zero

17. Increasing/Decreasing

$f'(x) > 0 \Rightarrow$ Increasing

$f'(x) < 0 \Rightarrow$ Decreasing

18. $\int (6x^5/(x^6+1))dx$

Let $t = x^6 + 1$

$dt = 6x^5 dx$

$\Rightarrow \ln(x^6 + 1) + C$

खंड - C (4 अंक - Stepwise)

19. Matrix Method

हल करने पर:

$$x=1$$

$$y=2$$

$$z=3$$

20. $y=e^x \cos x$

$$dy/dx=e^x \cos x - e^x \sin x$$

$$d^2y/dx^2=-2e^x \sin x$$

21. $\lim (x^2-a^2)/(x-a)$

$$= (x+a)$$

$$x \rightarrow a \Rightarrow 2a$$

22. $\int_0^\pi x^2 \sin x \, dx$

By parts twice:

$$= \pi^2 - 4$$

23. यदि $f'(x)=0$ और $f''(x)>0$

Slope zero और curvature up \Rightarrow Local Minimum

24. दो समतलों के बीच कोण

यदि normals n_1, n_2

$$\cos \theta = \frac{n_1 \cdot n_2}{|n_1| |n_2|}$$

25. $dy/dx + 2y=e^x$

$$IF=e^{2x}$$

$$\Rightarrow y e^{2x} = \int e^{3x} dx$$

$$\Rightarrow y = (1/3)e^x + Ce^{-2x}$$

26. Total Probability Theorem

$$P(B) = \sum P(A_i)P(B | A_i)$$

पूर्ण प्रमाण सहित।

27. $|\mathbf{a} \times \mathbf{b}| = |\mathbf{a}| |\mathbf{b}| \sin \theta$

Cross product परिभाषा से सिद्ध।

28. Maclaurin Series

$$f(x) = f(0) + xf'(0) + \frac{x^2}{2!} f''(0) + \dots$$

खंड - D (6 अंक)**29. Rolle's Theorem**

यदि $f(a)=f(b)$, सतत और अवकलनीय

$\Rightarrow \exists c$ such that $f'(c)=0$

$f(x)=x^3-x$ पर लागू।

30. $\int x^3 e^x dx$

$$= e^x(x^3 - 3x^2 + 6x - 6) + C$$

31. Gauss Elimination

Row reduction से:

$$x=2$$

$$y=1$$

$$z=3$$

32. Skew Lines Distance

$$D = \frac{|(a_2 - a_1) \cdot (b_1 \times b_2)|}{|b_1 \times b_2|}$$

पूर्ण determinant प्रमाण सहित।

33. $dy/dx=(x^2+y^2)/(xy)$

Homogeneous DE

Let $y=vx$

हल करने पर:

$$x^2+y^2=Cxy$$
