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Reg. No. :

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B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2024.

First Semester

Mathematics

Foundation Course – BRIDGE MATHEMATICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL questions.

Choose the correct answer.

1. If $n \in N$, then the number of terms in the expansion of $(a + b)^n$ is _____

(a) n

(b) $n + 1$

(c) $n - 1$

(d) $2n$

2. The coefficient of x^5 in the expansion of $(1+x)^{10}$ is _____
- (a) 0 (b) 10
(c) 50 (d) 252
3. The geometric mean of the numbers 9, 24, 125 is _____
- (a) 30 (b) 24
(c) 50 (d) 60
4. $6! - 5! =$ _____
- (a) 1 (b) 10
(c) 600 (d) 96
5. ${}^np_{n-1} =$ _____
- (a) $(n-1)!$ (b) $n!$
(c) n (d) $n-1$
6. If ${}^{15}C_{2r-1} = {}^{15}C_{2r+4}$, then $r =$ _____
- (a) 8 (b) 7
(c) 3 (d) 6

7. $\frac{1}{\sec \theta} = \underline{\hspace{2cm}}$
- (a) $\cos \theta$ (b) $\sin \theta$
(c) $\operatorname{cosec} \theta$ (d) $\cot \theta$
8. $\sin 765^\circ = \underline{\hspace{2cm}}$
- (a) 0 (b) 1
(c) $\frac{1}{\sqrt{2}}$ (d) $\frac{\sqrt{3}}{2}$
9. $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = \underline{\hspace{2cm}}$
- (a) 0 (b) 1
(c) -1 (d) ∞
10. $\frac{d}{dx}(e^x) = \underline{\hspace{2cm}}$
- (a) xe^{x-1} (b) $\log x$
(c) xe^x (d) e^x

PART B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find the constant term of $\left(2x^3 - \frac{1}{3x^2}\right)^5$.

Or

- (b) Expand $(2x + 3)^5$.

12. (a) If N days contains $N!$ minutes, find the value of N .

Or

- (b) Count the number of positive integers greater than 7000 and less than 8000 which are divisible by 5, provided that no digits are repeated.

13. (a) If $(n+2)P_1 = 42 \times nP_2$, find the value of n .

Or

- (b) For what value on n , $nC_4 = 495$?

14. (a) Prove: $\cos\left(\frac{3\pi}{4} + x\right) - \cos\left(\frac{3\pi}{4} - x\right) = -\sqrt{2} \sin x$.

Or

- (b) Prove: $\frac{\sin \theta + \sin 2\theta}{1 + \cos \theta + \cos 2\theta} = \tan \theta$.

15. (a) Compute: $\lim_{x \rightarrow 0} \left[\frac{x^2 + x}{x} + 4x^3 + 3 \right]$

Or

- (b) Find y''' if $y = \frac{1}{x}$.

PART C — (5 × 8 = 40 marks)

Answer ALL question.

16. (a) Find the last two digits of the number 7^{400} .

Or

- (b) The 2nd, 3rd and 4th terms in the expansion of $(x + a)^n$ are 240, 720 and 1080 respectively. Find x , a and n .

17. (a) For two numbers, if the arithmetic mean is Am , the geometric mean is Gm and the harmonic mean is Hm , then show that $Am \geq Gm \geq Hm$.

Or

- (b) Describe the harmonic mean.

18. (a) A number of four different digits is formed with the use of the digits 1, 2, 3, 4 and 5 in all possible ways.

- (i) How many such numbers can be formed?
- (ii) How many of them are even?
- (iii) How many of them are exactly divisible by 4?

Or

- (b) Prove : $n_{C_r} + n_{C_{r-1}} = (n+1)C_r$.

19. (a) If $A + B = 45^\circ$, then show that $(1 + \tan A)(1 + \tan B) = 2$.

Or

- (b) Evaluate : $\sin 18^\circ$.

20. (a) If $y = \tan^{-1}\left(\frac{1+x}{1-x}\right)$, find y' .

Or

- (b) Evaluate: $\int \frac{1}{\sqrt{x+1} + \sqrt{x}} dx$.
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