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Reg. No. :

Code No. : 20657 E Sub. Code : EFMA 11

B.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

First Semester

Mathematics

Foundation Course — BRIDGE MATHEMATICS

(For those who joined in July 2023 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. ${}^1C_1 =$
(a) 0 (b) 1
(c) 2 (d) None of the above
2. $(a+b)^n, n \in N =$
(a) $\sum_{k=0}^n nC_k a^{n-k} b^k$ (b) $\sum_{k=0}^n (n+1)C_k a^{n-k} b^k$
(c) $\sum_{k=0}^n (n-1)C_k a^{n-k} b^k$ (d) $\sum_{k=0}^n nC_{k+1} a^{n-k} b^k$

3. $e^x =$

- (a) $\sum_{n=0}^{\infty} \frac{x^n}{n!}$ (b) $\sum_{n=1}^{\infty} \frac{x^n}{n!}$
(c) $\sum_{n=0}^{\infty} \frac{x^n}{(n+1)!}$ (d) $\sum_{n=0}^{\infty} \frac{x^n}{(n-1)!}$

4. When $|x| < 1$, $\sum_{n=0}^{\infty} x^n =$

- (a) $(1+x)^{-1}$ (b) $(1-x)^{-1}$
(c) $(1-x)^{-2}$ (d) $(1+x)^{-2}$

5. ${}^5P_3 =$

- (a) 16 (b) 61
(c) 60 (d) 160

6. $\frac{{}^6P_2}{{}^6C_2} =$

- (a) 6 (b) 2
(c) 8 (d) 4

7. $\sin 2\theta =$

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



8. $\sin 18^\circ = \underline{\hspace{2cm}}$.

- (a) $\cos 18^\circ$ (b) $\cos 36^\circ$
(c) $\cos 72^\circ$ (d) $\sin 54^\circ$

9. $\lim_{x \rightarrow 0} |x| = \underline{\hspace{2cm}}$.

- (a) ∞ (b) x
(c) $-x$ (d) 0

10. If $y = x^3 - 6x^2 - 5x + 3$, then $y'' = \underline{\hspace{2cm}}$

where $y'' = \frac{d^2 y}{dx^2}$.

- (a) $3x^2 - 12x - 5$ (b) $6x - 12$
(c) 6 (d) $3x^2 + 12x + 5$

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Prove that $nC_r + nC_{r-1} = (n+1)C_r$.

Or

(b) Prove that $nC_0 + nC_1 + nC_2 + \dots + nC_n = 2^n$.

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12. (a) Expand $\frac{1}{(1+3x)^2}$.

Or

(b) Prove that $\frac{e+e^{-1}}{2} = 1 + \frac{1}{2!} + \frac{1}{4!} + \frac{1}{6!} + \dots$.

13. (a) A salad at a certain restaurant consists of 4 of the following fruits : apple, banana, guava, grapes, pomegranate, papaya and pineapple. Find the total possible number of fruit salads.

Or

(b) Find (i) $5P_3$ (ii) $8P_4$ (iii) $6P_5$.

14. (a) Prove that $1 - \frac{1}{2} \sin 2x = \frac{\sin^3 x + \cos^3 x}{\sin x + \cos x}$.

Or

(b) Prove that

$$\sin 4A = 4 \sin A \cos^3 A - 4 \cos A \sin^3 A.$$

15. (a) Find $\frac{d}{dx} (2^x)$.

Or

(b) Find $\int \sqrt{15-2x} dx$.

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PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Find $\sqrt[3]{65}$.

Or

(b) Compute 102^4 .

17. (a) Write the first 6 terms of the sequences whose n^{th} term a_n is given below :

(i) $a_n = \begin{cases} n+1 & \text{if } n \text{ is odd} \\ n & \text{if } n \text{ is even} \end{cases}$

(ii) $a_n = \begin{cases} n & \text{if } n \text{ is 1, 2 or 3} \\ a_{n-1} + a_{n-2} + a_{n-3} & \text{if } n > 3 \end{cases}$

(iii) $a_n = \frac{(-1)^n}{n}$.

Or

(b) Evaluate $\frac{n!}{r!(n-r)!}$ when

(i) $n = 7, r = 5$

(ii) $n = 50, r = 47$

(iii) For any n , with $r = 3$.

18. (a) Prove that $10C_2 + 2 \times 10C_3 + 10C_4 = 12C_4$.

Or

(b) If $10P_r = 7P_{r+2}$, find r .

19. (a) Find $\tan(A+B+C)$.

Or

(b) Simplify : $\frac{\sin 75^\circ - \sin 15^\circ}{\cos 75^\circ + \cos 15^\circ}$.

20. (a) If $y = \frac{\cos x}{x^3}$, find $\frac{dy}{dx}$.

Or

(b) Evaluate $\int \log x \, dx$.

