

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. If x is so small that x^4 and higher powers of x can be neglected, show that $(1+x)^{1+x} = 1+x+x^2+\frac{1}{2}x^3$, nearly.

17. Solve the equation

$$4x^4 - 20x^3 + 33x^2 - 20x + 4 = 0.$$

18. Solve the system of equations by Cramer's rule

$$2x + 3y - z = 1$$

$$4x + y - 3z = 11$$

$$3x - 2y + 5z = 21$$

19. Prove that $-64\sin^7\theta = \sin 7\theta - 7\sin 5\theta + 21\sin 3\theta - 35\sin \theta$.

20. Show that $\log \tan\left(\frac{\pi}{4} + \frac{ix}{2}\right) = i \tan^{-1}(\sinh x)$.



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APRIL/MAY 2019

BAEL12 — BASIC MATHEMATICS – I.

Time : Three hours

Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL the questions.

- Resolve into partial fractions $\frac{2x+3}{(x^2+1)(x+4)}$.
- If $|x| > 1$ prove $\frac{1}{x} + \frac{1}{3x^2} + \frac{1}{5x^4} + \dots \log \sqrt{\frac{x+1}{x-1}}$.
- Form the equation with rational coefficients one of which is $\sqrt{2} + \sqrt{3}$.
- Show that $4(x^2 - x + 1)^3 = 27x^2(x-1)^2$ is a standard reciprocal equation.
- Define Rank of a matrix.
- If $A = \begin{pmatrix} 2 & 1 \\ 4 & -1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \end{pmatrix}$, $C = \begin{pmatrix} 2 & 1 & 3 \\ 3 & 4 & 1 \\ -1 & 3 & 2 \end{pmatrix}$ then find $(AB)C$.
- Define Demoivre's theorem.



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8. Expand $\tan 7\theta$ in terms of $\tan \theta$.
9. Prove that $\cos ix = \cosh x$.
10. Write the formula for $\log(x + iy)$.

SECTION B — (5 × 5 = 25 marks)

Answer ALL the questions.

11. (a) Find the sum to infinity of the series
 $1 + \frac{2}{6} + \frac{2.5}{6.12} + \frac{2.5.8}{6.12.18} + \dots \infty$.

Or

- (b) Sum to infinity the series
 $\frac{1.2}{1!} - \frac{2.3}{2!} + \frac{3.4}{3!} - \frac{4.5}{4!} + \dots$

12. (a) If α, β, γ are the roots of the equation $x^3 + px^2 + qx + r = 0$. Find the value of

- (i) $\sum \alpha^2$
 (ii) $\sum \alpha^2 \beta$
 (iii) $\sum \alpha^2 \beta^2$.

Or

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- (b) If α, β, γ are the roots of the equation $ax^3 + bx^2 + cx + d = 0$. Find the equation whose roots are $\alpha^2, \beta^2, \gamma^2$.

13. (a) Find AB and BA given that $A = \begin{pmatrix} 2 & -1 & 0 \\ 0 & -2 & 1 \\ 1 & 0 & 1 \end{pmatrix}$

and $B = \begin{pmatrix} -2 & 1 & -1 \\ -1 & 2 & -2 \\ 2 & -1 & -4 \end{pmatrix}$.

Or

- (b) Find the rank of $\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & 1 & 0 & 2 \\ 2 & -1 & 6 & 5 \end{pmatrix}$.

14. (a) Expand $\sin \theta$ in ascending powers of θ .

Or

- (b) Evaluate $\lim_{x \rightarrow 0} \frac{5 \sin x - \sin 5x}{5(\cos x - \cos 5x)}$.

15. (a) Express $\cosh^6 \theta$ in terms of hyperbolic cosines of multiples of θ .

Or

- (b) Obtain the general value of $\log i$.

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