18. Evaluate $\int \sqrt{\frac{(x-1)}{(2x+3)}}dx$.

19. Evaluate $\int_0^{\frac{\pi}{2}} \cos^h x\, dx$ (n being a positive integer).

20. Obtain the complete solution and singular solution of $z = px + qy + p^2 + pq + q^2$.

APRIL/MAY 2019

BAEL22 — BASIC MATHEMATICS – II

Time : Three hours Maximum : 75 marks

SECTION A — ($10 \times 2 = 20$ marks)

Answer ALL questions.

1. State Leibtnitz theorem.
2. Differentiate $y = (\sin x)^x$.
3. Define pedal equation.
4. Find the angle which the tangent at $(2, 4)$ to the curve $y = 6 + x - x^2$ makes with the x-axis.
5. Evaluate $\int \sqrt{3-5x}\, dx$.
6. State Bernoulli's formula.
7. Prove that $\int_0^a f(x)\, dx = \int_0^a f(a-x)\, dx$.
8. Find the Fourier constant b_n for $x \sin x$ in $(-\pi, \pi)$.

9. Solve $\frac{\partial^2 z}{\partial x^2} = \sin x$.

10. Define singular integral.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Find the differential coefficient of $\frac{(a-x)^2(b-x)^3}{(c-2x)^3}$.

Or

(b) If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x}}}$ .... to ∞ Find $\frac{dy}{dx}$.

12. (a) Find the pedal equation of the curve $r^n = a^n \sin n\theta$.

Or

(b) If $F = \frac{1}{\sqrt{x^2+y^2+z^2}}$ show that $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2} = 0$.

13. (a) Evaluate $\int \frac{dx}{\sqrt{3x^2+4x+2}}$.

Or

(b) Evaluate $\int \frac{dx}{13+5\cos x}$.

14. (a) Evaluate $\int_0^{\pi} \theta \sin^5 \theta \, d\theta$.

Or

(b) Obtain a Fourier expansion for the function $f(x) = \frac{1}{2}(\pi - x) 0 < x < 2\pi$.

15. (a) Solve $p + q = x + y$.

Or

(b) Solve $q = -px + p^2$.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. If $y = \sin(m \sin^{-1} x)$ prove that $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} + (m^2 - n^2)y_n = 0$.

17. Find the angle of intersection of the curves $r = \frac{a}{1+\cos\theta}$ and $r = \frac{b}{1-\cos\theta}$.