B.C.A DEGREE EXAMINATION,APRIL 2020
I Year I Semester
Allied Mathematics - I

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. Find the truth table for $\sim p \wedge q$.
2. Show that $p \to q$ and $q \to p$ are not logically equivalent.
3. Write the expansion of $\cos n\theta$ in powers of $\sin\theta$ and $\cos\theta$.
4. Prove that $\dfrac{\sin 5\theta}{\sin\theta} = 5 - 20\sin^2\theta + 16\sin^4\theta$.
5. Prove that $\cosh^2 x - \sinh^2 x = 1$.
6. Find the real and imaginary parts of $\cos(\alpha - i\beta)$.
7. Find Laplace Transform of $\left[5 - e^{2t} + 6t^2\right]$
8. Find Laplace transform of $\left[\cos^2 2t\right]$.
9. Find Inverse Laplace transform of$^{-1}\left[\frac{6}{(s-1)^4}\right]$.
10. Find Inverse Laplace transform $\left[\dfrac{1}{(s+1)(s+2)}\right]$.
11. Prove that $\sim (p \vee q) \equiv \sim p \wedge \sim q$.
12. Find Laplace transform $\left[(t+1)^2\right]$.

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Prove that the proposition $p \vee \sim (p \wedge q)$ is a tautology.
14. Prove that $16\sin^5\theta = \sin 5\theta - 5\sin 3\theta + 10\sin\theta$.
15. Prove that $\sinh 3x = 3\sinh x + 4\sinh^3 x$.
16. Find Laplace transform of $(t\sin 3t\cos 2t)$.
17. Find Inverse Laplace transform of $\left[\dfrac{s-3}{s^2+4s+13}\right]$.
18. Prove that $\cos 6\theta = 32\cos^6\theta - 48\cos^4\theta + 18\cos^2\theta - 1$.
19. If $\cos(\theta + i\phi) = k(\cos\alpha + i\sin\alpha)$, prove that $\cos 2\theta + \cosh 2\phi = 2k^2$.

Section C $(3 \times 10 = 30)$ Marks

Answer any **THREE** questions

20. Test the validity of the argument $p \rightarrow \sim q$, $r \rightarrow p$, $|- \sim r$.
21. Expand $\sin^3\theta\cos^5\theta$ in a series of sines of multiples of θ.
22. If $\sin(A+iB) = x+iy$, prove that (i) $\dfrac{x^2}{\cosh^2 B} + \dfrac{y^2}{\sinh^2 B} = 1$
    (ii) $\dfrac{x^2}{\sin^2 A} - \dfrac{y^2}{\cos^2 A} = 1$.
23. Find (i) Laplace transform $\left[e^{-3t}\cos 2t\right]$ (ii) Laplace transform $\left[\dfrac{\cos 3t - \cos 2t}{t}\right]$.
24. Find Inverse Laplace transform of $\left[\dfrac{-8s^2 - 5s + 9}{(s+1)(s-1)(s-2)}\right]$.

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