B.C.A DEGREE EXAMINATION,APRIL 2019
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. Negate the statement "Every student in this class is intelligent" in two different ways.
2. Show that $P \to \theta$ and $\neg P \vee Q$ are logically equivalent.
3. Write down the expansion of $\tan n\theta$
4. If $\dfrac{\sin \theta}{\theta} = \dfrac{5045}{5046}$ show that θ is equal to $1°58'$ nearly.
5. Write down the relations between circular functions and hyperbolic functions.
6. Prove that $\tanh 2x = \dfrac{2 \tan hx}{1 + \tan h^2 x}$
7. Find $L(\sin^2 t)$.
8. State the conditions for the existence of Laplace transform of a function.
9. $L^{-1}\left(\dfrac{s}{(s+2)^2}\right)$.
10. $L^{-1}\left(\dfrac{1}{(s+2)^{20}}\right)$.
11. Write down the series expansion of $\sin hx$.
12. State a change of scale property of Laplace transform.

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

Answer any **FIVE** questions

13. Prove $\neg P \to (Q \to R) \equiv Q \to (P \vee R)$
14. Express $\dfrac{\cos 7\theta}{\cos \theta}$ as a polynomial in $\sin \theta$
15. Show that $\cos h^{-1}x = \pm \log(x + \sqrt{x^2 - 1})$
16. Find the Laplace transform of $t^2 e^{-t} \cos t$
17. Find the inverse Laplace transform of $\dfrac{s^2 - s + 2}{s(s+2)(s-3)}$

18. Find $L\left[\int_0^t \frac{e^{-t}\sin t}{t} dt\right]$

19. Separate into real and imaginary parts $\tan^{-1}(x+iy)$

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

Answer any **THREE** questions

20. Without using truth table prove the given statement formula is tautology
    $$((P \vee Q) \wedge \neg(\neg P \wedge (\neg Q \vee \neg R))) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge (\neg R)$$

21. Expand $\sin^3 \theta \cos^4 \theta$ in terms of sines of multiples of θ

22. If $\tan(\theta + i\phi) = x + iy$,then show that
    $$1) x^2 + y^2 + 2x \cot 2\theta = 1$$

    $$2) x^2 + y^2 - 2y \cot h2\theta = -1$$

23. Find
    $$a) L\left(\frac{e^{-3t}-e^{-4t}}{t}\right)$$

    $$b) L(e^{-5t}\cos^2 t)$$

24. Find
    $$a) L^{-1}\left(\log \frac{1+s}{s^2}\right)$$

    $$b) L^{-1}(\tan^{-1}(s+1))$$

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