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MATH122 Enrol. No. A2305223603

[ST]

END SEMESTER EXAMINATION : APRIL-MAY, 2024

APPLIED MATHEMATICS – II

Time : 3 Hrs. *Maximum Marks : 60*

Note: ***Attempt questions from all sections as directed.***

SECTION – A (24 Marks)

Attempt any **four** *questions out of* **five.**

Each question carries **06** *marks.*

1. Solve $x^2dy + y\,(x + y)dx = 0$.

2. Solve $(D^2 - 3D + 2)y = x^2$.

3. Obtain the inverse Laplace Transform of $\cot^{-1}\left(\frac{s}{2}\right)$.

P.T.O.

4. Find the solution of initial value problem using Laplace Transformation;

$y'' + 9y = 6 \cos 3t$ Given that: $y(0) = 2,\ y'(0) = 0$

5. Evaluate $\int_0^\infty te^{-2t} \sin t \, dt$.

SECTION – B (20 Marks)

Attempt any **two** *questions out of* **three**.

Each question carries **10** *marks.*

6. Solve $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} - 3y = x^2 \log x$.

7. Examine the nature of the function

$$f(z) = \begin{cases} \frac{x^3 y(y - ix)}{x^6 + y^2}, & z \neq 0 \\ 0, & z = 0 \end{cases}$$

Prove that $\frac{f(z) - f(0)}{z - 0}$ tends to 0 as $z \to 0$ along any radius vector but not in any manner. Also show that $f(z)$ is not analytic at $z = 0$.

8. (a) Evaluate $\int_0^{1+i} (x^2 - iy)\, dz$, along the path $y = x^2$. (5)

(b) Use Cauchy integral formula to evaluate.

$$\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$$

where c is the circle $|z| = 3$. (5)

SECTION – C (16 Marks)

(Compulsory)

9. (a) Show that the function $u = 4xy - 3x + 2$ is harmonic. Construct the corresponding analytic function $f(z) = u + iv$. Also express $f(z)$ in terms of z. (8)

P.T.O.

(b) Evaluate $\int_C \frac{e^z}{\cos \pi z} dz$, where C is the unit circle $|z| = 1$. (8)