

Roll No. ....

Total No. of Questions : 09]

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**Paper ID [CS203]**

(Please fill this Paper ID in OMR Sheet)

**B.Tech. (Sem. - 3<sup>rd</sup>/4<sup>th</sup>)**

**MATHEMATICS - III (CS - 204/203)**

Time : 03 Hours

Maximum Marks : 60

**Instruction to Candidates:**

- 1) Section - A is **Compulsory**.
- 2) Attempt any **Five** questions from Section - B & C.
- 3) Select atleast **Two** questions from Section - B & C.

**Section - A**

**Q1)**

(10 x 2 = 20)

- a) Write down the statement of Rolle's theorem.
- b) Define analytic function.
- c) Define Laplace transform, also write down three properties of Laplace transformation.
- d) Write down Laplace equations.
- e) Determine analytic function, whose real part is  $\cos x$  cosh  $y$ .
- f) Expand  $\frac{1}{(Z+1)(Z+3)}$  in Laurent's series.
- g) Find the inverse Laplace transform of  $\left(\frac{s^2}{(s^2+4)^2}\right)$ .
- h) Write down the Runge-Kutta formula.
- i) Using C-R equations, show that  $f(z) = z^3$  is analytic in the entire  $z$ -plane.
- j) Define Residues with an example.

**Section - B**

(Marks : 8 Each)

**Q2)** Verify Rolle's Theorem for

$$F(x) = x(x+3)e^{\frac{-x}{2}} \text{ in the interval } (-3,0).$$



- Q3)** Expand  $\tan^{-1} \frac{y}{x}$  in the neighborhood of (1,1) by Taylor's Theorem.
- Q4)** Define continuity of the function, also write the properties of continuous function.
- Q5)** Evaluate the following integral using Cauchy integral formula
- $$\int_c \frac{4-3z}{z(z-1)(z-2)} dz$$

### Section - C

(Marks : 8 Each)

- Q6)** Find the residue of  $f(z) = \frac{ze^z}{(z-a)^3}$ .
- Q7)** Use the method of separation of variables to solve the equation
- $$\frac{\partial^2 v}{\partial x^2} = \frac{\partial v}{\partial t}$$
- Q8)** The ends A and B of a rod 20 cm long have the temperatures at 30°C and at 80°C until steady state prevails. The temperature of the ends is changed to 40°C and 60°C respectively. Find the temperature distribution in the rod at time  $t$ .
- Q9)** Apply Runge-Kutta formula to find an approximate value of  $y$  when  $x=1.1$  given that:  $\frac{dy}{dx} = x - y$ .

