JHARKHAND Rai University RANCHI

Reappear (Semester III) Examination December,2024

Programme: Diploma (MiE) **Full Marks: 70**
Course: Applied Mathematics **Time: 3 Hrs.**
Course Code: 9D 204
Enrolment no. _____

Section I

1. **Short Answer type questions. Answer any four.** **4 x 5 = 20**
   a. Define the Cauchy - Riemann equation with condition.
   b. What is Bernoulli's equation? What are the steps to solve Bernoulli's Equation?
   c. Define spanning tree with proper example.
   d. Use Bisection method, to find a positive root of the equation $x^3 + 2x - 2 = 0$ up to two Approximations.
   e. What is the necessary and sufficient condition for exact differential equation?
   f. Define degree of a vertex with proper example.

Section II

Long Answer type questions. Answer any three. **3 x 10 = 30**

2. Show that the function $f(x) = e^x(\cos y + i \sin y)$ is analytic function, find its derivatives.
3. Solve $(x^2 + y^2)dx = 2xy\, dy$
4. Prove if G is graph which is degree of every vertex is at least two then G contains a cycle.
5. Find the positive root of $x^4 - x - 10 = 0$ correct three decimal place using N – R Method.
6. Solve given Bernoulli equation:
   i. $2x\frac{dy}{dx} + y = x^3y^6$
   ii. $x\frac{dy}{dx} + y \log y = xy\, e^x$

Section III

Application based questions. Answer any one. **1 x 20 = 20**

7. Find the positive root of the equation $x^3 + 2x - 5 = 0$, correct up to two significant figures by the Newton – Raphson Method.
8. Show that if any two vertices of a loop less graph G are connected by a unique path then G is a tree.
9. Prove that $u = x^2 - y^2$ and $v = \frac{y}{x^2+y^2}$ are harmonic functions of (x, y) but are not harmonic conjugate.

*****