Printed Page:- 05 **Subject Code:-** AAS0301A

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - AUGUST 2023

Subject: Engineering Mathematics-III

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1-a. Polar form of Cauchy Riemann equation is (CO1) 1

(a) $\frac{\delta u}{\delta r} = r\frac{\delta v}{\delta \theta}, \frac{\delta u}{\delta \theta} = r\frac{\delta v}{\delta r}$

(b) $\frac{\delta u}{\delta r} = \frac{1}{r}\frac{\delta v}{\delta \theta}, \frac{\delta v}{\delta r} = -\frac{1}{r}\frac{\delta u}{\delta \theta}$

(c) $\frac{\delta u}{\delta r} = \frac{\delta v}{\delta \theta}, \frac{\delta v}{\delta r} = r\frac{\delta u}{\delta \theta}$

(d) $\frac{\delta u}{\delta r} = \frac{\delta v}{\delta \theta}, \frac{\delta v}{\delta r} = \frac{\delta u}{\delta \theta}$

1-b. Which one of the following is a bilinear transformation: (CO1) 1

(a) $w = \frac{2z+1}{4z+2}$

(b) $w = z$

(c) $w = \frac{iz-1}{z+i}$

(d) $w = \frac{(1+i)z+1}{2z+(1-i)}$

1-c. The residue for removable singularity is (CO2) 1

(a) 1

(b) 0

(c) 2

(d) None of these

1-d. Point $z = a$ is called a removable singular point of $f(z)$,if (CO2) 1

(a) $\lim_{z \to a} f(z)$ exist and non-zero.

(b) $\lim_{z \to a} f(z)$ exist and finite.

(c) $\lim_{z \to a} f(z)$ does not exist.

(d) All of the above

1-e. Which of the following is a two-dimensional wave equation? (CO3) 1

(a) $\frac{\partial u}{\partial t} = c^2\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$

(b) $u = c^2\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$

(c) $\frac{\partial^2 u}{\partial t^2} = c^2\left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}\right)$

(d) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

1-f. Classification of pde: $u_{xx} + u_{xt} + u_{tt} = 0$ is: (CO3) 1

(a) Parabolic

(b) Hyperbolic

(c) Elliptic

(d) None of these

1-g. Which of the following method is employed for solving the system of linear equations? (CO4) 1

(a) Runge Kutta

(b) Newton Raphson

(c) Simpson's Rule

(d) Gauss Seidal

1-h. Newton- Gregory Forward interpolation formula can be used _____(CO4) 1

(a) Only for equally spaced intervals

(b) Only for unequally spaced intervals

(c) For both equally and unequally spaced intervals

(d) For unequally intervals

1-i. The length of the bridge, which a train 130 meters long and travelling at 45 km / hr can cross in 30 seconds, is (CO5) 1

(a) 200 m

(b) 225 m

(c) 245 m

(d) 250 m

1-j. A and B can do a piece of work in 10 days. B and C can do it in 12 days. A and C can do it in 15 days. How long will A take to do it alone ? (CO5) 1

(a) 30 days

(b) 40 days

(c) 24 days

(d) None of these

2. Attempt all parts:-

2.a. Write a short note on analytic function. (CO1) 2

2.b. Evaluate $\int_c \frac{e^{-z}}{z+1} dz$, Where c is circle $|z| = 2$ (CO2) 2

2.c. Solve $r - 4s + 4t + p - 2q = 0$ (CO3) 2

2.d. Write formula for Simpson's 1/3rd rule. (CO4) 2

2.e. At what time between 2 and 3 o'clock will the hands of a clock be together? (CO5) 2

SECTION B **30**

3. Answer any five of the following:-

3-a. Show that the function $e^x (\cos y + i \sin y)$ is holomorphic and find its derivative. (CO1) 6

3-b. Show that $u = x^3 - 3xy^2$ is a harmonic function. Also find the corresponding analytic function. (CO1) 6

3-c. Evaluate the integral $\int_c \frac{4-3z}{z(z-1)(z-2)} dz$, where C is the circle $|z| = 3/2$ (CO2) 6

3-d. Evaluate $\int_0^{2\pi} \frac{\cos 2\theta \, d\theta}{5 + 4 \cos \theta}$. (CO2) 6

3.e. Solve $(DD' + D - D' - 1)z = xy$ (CO3) 6

3.f. Solve $x^3 - 5x + 3 = 0$ by using Regula Falsi method till 3rd iterations. (CO4) 6

3.g. Five girls are sitting on a bench to be photographed. Seema is to the left of Rani and to the right of Bindu. Mary is to the right of Rani. Reeta is between Rani and Mary. Who is in the middle of the photograph and who are setting at corners of photograph.(CO5) 6

SECTION C 50

4. Answer any one of the following:-

4-a. If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4\,|f'(z)|^2$. (CO1) 10

4-b. If $u - v = (x-y)(x^2+4xy+y^2)$ and $f(z) = u + iv$ is an analytic function of $z = x + iy$, then find $f(z)$. (CO1) 10

5. Answer any one of the following:-

5-a. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ 10

(i) $|z| < 1$

(ii) $1 < |z| < 3$

(iii) $1 < |z+1| < 2$ (CO2)

5-b. Determine the poles of the following function and residue at each poles: 10

$f(z) = \frac{z^2}{(z-1)^2(z+2)}$ and hence evaluate $\int_C f(z)\,dz$ where c is the circle $|z| = 3$ (CO2)

6. Answer any one of the following:-

6-a. Solve the PDE: $(D^2 + DD' - 6D'^2)z = y\cos x$.(CO3) 10

6-b. Use the method of separation of variables to solve the equation $\frac{\delta u}{\delta x} = 2\frac{\delta u}{\delta y} + u$ (CO3) 10

7. Answer any one of the following:-

7-a. Find the cubic polynomial which takes the following values (CO4) 10

x	0	1	2	3
f(x)	1	2	1	10

Also find f(0.5)

7-b. Solve, by Crout's method, the following system of equations: (CO4) 10

$x + y + z = 3;\ 2x - y + 3z = 16;\ 3x + y - z = -3.$

8. Answer any <u>one</u> of the following:-

8-a. **(i)** A and B together can do a piece of work in 30 days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone? 10

(ii) A man and a boy received Rs 800 as wages for 5 days for the work they did together. The man's efficiency in the work was three times that of the boy. What are the daily wages of the boy? (CO5)

8-b. **(i)** A man takes 2.2 times as long to row a distance upstream as to row the same distance downstream. If he can row 55 km downstream in 2 hours 30 minutes, what is the speed of the boat in still water? 10

(ii) The speed of the boat in still water is 5 times that of the current, it takes 1.1 hours to row to point B from point A downstream. The distance between point A and point B is 13.2km. How much distance (in km) will it cover in 312 minutes upstream? (CO5)