Printed Page:-04 **Subject Code:- AAS0301A / AASH0301A**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - THEORY EXAMINATION (2024-2025)

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. For which value of b, the function $u = e^{bx}\cos 5y$ is harmonic? (CO1, K2) 1

(a) ± 10

(b) ± 1

(c) ± 25

(d) ± 5

1-b. The function $f(z) = \bar{z}$ is (CO1, K1) 1

(a) Analytic everywhere

(b) Nowhere analytic

(c) Analytic at origin

(d) None of these

1-c. $\int_0^i idz$ is equal to (CO2, K3) 1

(a) $i - 1$

(b) i^2

(c) $-i$

(d) i

1-d. If there is no pole inside and on the contour, then the value of integral is (CO2, K2) 1

(a) ∞

(b) 0

(c) -1

(d) None of these

1-e. The complementary function of PDE $(D^2+5DD'^{+}6D'^2)Z=\frac{1}{(y-2x)}$ is (CO3, K1) 1

(a) $C.F.=f_1(y-2x)+f_2(y-3x)$

(b) $C.F.=f_1(y+2x)+f_2(y+3x)$

(c) $C.F.=f_1(y-2x)+f_2(y+3x)$

(d) $C.F.=f_1(y+2x)+f_2(y-3x)$

1-f. The Particular integral of the PDE $(D^2-2DD'+D'^2)Z=x^3$ is (CO3, K3) 1

(a) $P.I.=\frac{x^5}{15}$

(b) $P.I.=\frac{x^5}{25}$

(c) $P.I.=\frac{x^5}{20}$

(d) None of these

1-g. Trapezoidal rule for evaluating of $\int_a^b f(x)dx$ requires the interval (a , b) to be divided into (CO4, K2) 1

(a) 2 n subintervals of equal width

(b) 2n+1 subintervals of equal width

(c) Any number of subintervals of equal width

(d) None of these

1-h. Newton forward interpolation formula used for lengths of intervals (CO4, K1) 1

(a) Unequal intervals

(b) Equal Intervals

(c) Open Interval

(d) None of these

1-i. One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, then the slower pipe alone will be able to fill the tank in (CO5, K3) 1

(a) 81 min

(b) 108 min

(c) 144 min

(d) 192 min

1-j. A boatman rows 1 km in 5 minutes, along the stream and 6 km in 1 hour against the stream. The speed of the stream is (CO5, K3) 1

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(a) 3 kmph
(b) 6 kmph
(c) 10 kmph
(d) 12 kmph

2. Attempt all parts:-

2.a. Write the Cauchy's Riemann Equation in polar form . (CO1, K1) 2

2.b. State Cauchy's integral formula. (CO2, K1) 2

2.c. Solve the PDE: $(D-5D'+1)^2 z=0$. (CO3, K3) 2

2.d. Write Regula false method. (CO4, K1) 2

2.e. A motorist travelled between two towns, which are 65 km apart, in 2 hours and 10 minutes. Find the speed in metres per minute? (CO5, K3) 2

SECTION-B 30

3. Answer any five of the following:-

3-a. Find the bilinear transform which maps the points $z=0,-1,i$ into the points $w=i,0,\infty$ respectively.(CO1, K3) 6

3-b. Show that the function e^x(cos y +i sin y) is analytic and find its derivative.(CO1, K3) 6

3-c. Expand the function $f(z)=\frac{e^z}{(z-1)^2}$ about $z=1$. (CO2, K3) 6

3-d. Evaluate the integral $\int_c \frac{4-3z}{z(z-1)(z-2)}dz$, where C is the circle $|z|=3/2$ (CO2, K3) 6

3.e. Solve the PDE : $(D^2-2DD'-15D'^2)z=12xy$. (CO3, K2) 6

3.f. Find a positive value of $(17)^{1/3}$ correct to the five decimal places by Newton Raphson Method. (CO4, K3) 6

3.g. A, B and C can complete a piece of work in 15, 12, 10 days respectively. A and B started the work together and left after 4 days. If the remaining work can be done by C, then in how many days the total work gets completed? (CO5, K3) 6

SECTION-C 50

4. Answer any one of the following:-

4-a. Show that for the function $f(z)=\left\{\frac{2xy^2(x+iy)}{x^2+y^4}, \quad z\neq 0\right\}, \ f(0)=0,$ the C-R equations are satisfied at origin but derivatives of f(z) does not exist at origin. (CO1, K2) 10

4-b. Show that the function $u(x,y)=e^x \cos y$ is harmonic. Determine its harmonic - conjugate $v(x,y)$ and the analytic function f(z). (CO1, K3) 10

5. Answer any one of the following:-

5-a. Expand $\frac{1}{(z+1)(z+3)}$ in the region: 10

(i) $|z| < 1$

(ii) $1 < |z+1| < 2$ (CO2, K3)

5-b. Evaluate the integral $\int_0^{\pi} \frac{d\theta}{5+4\cos\theta}$ by using contour integration. (CO2, K3) 10

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

6-a. Solve the PDE: $(D^2 - D'^2 - 3D + 3D')z = xy + e^{x+2y}$. (CO3, K3) 10

6-b. Solve the PDE: $\frac{\partial^2 u}{\partial y^2} + \frac{\partial u}{\partial x} = 0$ subject to the condition: $u(x, 0) = 0$, $u(x, \pi) = 0$, $u(0, y) = 4\sin 3y$ by method of separation of variables. (CO3, K3) 10

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

7-a. Solve the system of equation by crout's method 10

$2x + y + 4z = 7;\ 3x + y + 2z = 6;\ -x + 4y + 2z = 5.$ (CO4, K3)

7-b. Apply Runge Kutta method to find an approximate value of y when $x = 0.2$, given that $\frac{dy}{dx} = x + y^2,\ y = 1$ when $x = 0$. (CO4, K3) 10

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

8-a. (i) A can do a work in 4 days, B in 5 days and C in 10 days. Find the time taken by A, B and C to do the work together? 10

(ii) If Roger can do a piece of work in 8 days and Antony can complete the same work in 5 days, in how many days will both of them together complete it? (CO5, K3)

8-b. Read the information given below and answer the following questions: 10

A total of 10 people, 5 men and 5 women are sitting in two parallel lines, facing each other. Five men, namely, Ajit, Bharat, Chirag, Dharam and Ejaz are facing to the south and the five women, Meenal, Neelu, Octavia, Preeti and Arpita are facing towards the north.

Bharat, who is just next to the left of Dharam, is opposite to Arpita.

Chirag and Neelu are diagonally opposite to each other.

Ejaz is opposite Octavia who is just next to Meenal.

Preeti, who is just to the left of Arpita, is opposite to Dharam.

Meenal is at one end of the line

I. Which two people are sitting at the two extreme right ends of the line?

II. Who is sitting in front of Dharam?

III. Who sits exactly in between Meenal and Preeti?

IV. Who sits opposite to Octavia?

V. Who is sitting at the left corner of the men's line? (CO5, K3)