Printed Page:- Subject Code:- AAS0301A

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - LATERAL / LEFT OVER THEORY EXAMINATION (2021 - 2022) (ONLINE)

Subject: Engineering Mathematics III

Time: 02:00 Hours Max. Marks: 100

General Instructions:

1. *All questions are compulsory. It comprises of two Sections A and B.*

- *Section A - Question No- 1 has 35 objective type questions carrying 2 marks each.*
- *Section B - Question No- 2 has 12 subjective type questions carrying 3 marks each. You have to attempt any 10 out of 12 question.*
- *No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.*

SECTION A 35 x 2 = 70

1. Attempt ALL parts:-

1.1.a Analytic function is also known as [CO 1] 1

(a) Regular function
(b) Holomorphic function
(c) Both A & B
(d) None of these

1.1.b *For which value of b,the function $u = e^{bx}\cos 5y$ is harmonic* [CO 1] 1

(a) ± 10
(b) ± 1
(c) 5
(d) ± 5

1.1.c *Function $u(r,\theta) = (r - 1/r)\ \sin\theta$ is* [CO 1] 1

(a) Harmonic
(b) Not harmonic
(c) Can't say
(d) None of these

1.1.d An analytic function $f(z)$ in terms of z if $u - 2v = \cos x \cosh y + 2\ \sin x \sinh y$ *is* 1
[CO 1]

(a) $f(z) = \sin z + c$
(b) $f(z) = \cos z + c$
(c) $f(z) = \sinh z + c$
(d) None of these

1.1.e If Imaginary part of an analytic function $f(z) = u + iv$ is given then by Milne's Thomson method. [CO 1] 1

(a) $f(z) = \int \psi_1(z,o)dz + i\int \psi_2(z,0)dz + c$
(b) $f(z) = \int \psi_1(z,o)dz - i\int \psi_2(z,0)dz + c$
(c) $f(z) = \int \psi_2(z,o)dz + i\int \psi_1(z,0)dz + c$

(d) $f(z) = \int \psi_2(z,o)dz - i\int \psi_1(z,0)dz + c$

1.1.f Bilinear Transformation is also known as [CO 1] 1

(a) Mobius Transformation
(b) Fractional Linear Transformation
(c) Both A & B
(d) None of these

1.1.g The bilinear transformation is [CO 1] 1

(a) $f(z) = \frac{az+b}{cz+d}, ad-bc=0$
(b) $f(z) = \frac{az+b}{cz+d}, ad-bc\neq 0$
(c) $f(z) = \frac{az+b}{cz+d}, ad-bc=1$
(d) None of these

1.2.a $\int_0^{2+i}(x^2+iy)dz$ along the path $y = x$ is equal to [CO2] 1

(a) $(\frac{2}{3}+\frac{14}{3}\,i)$
(b) $((3/2+3/14\,i)$
(c) $(2/3-14/3\,i)$

1.2.b $\int_0^1 z\bar{z}dz$ along the path $y^2 = x$ is equal to [CO2] 1

(a) $(\frac{6}{5}+\frac{15}{8}i)$
(b) $(\frac{5}{6}-\frac{8}{15}i)$
(c) $(\frac{6}{5}-\frac{8}{15}i)$
(d) $(\frac{3}{2}-\frac{4}{14}i)$

1.2.c $\int_0^i idz$ is equal to [CO2] 1

(a) $i - 1$
(b) i^2
(c) $-i$
(d) i

1.2.d Condition of analyticity in Cauchy integral theorem is [CO2] 1

(a) Necessary
(b) sufficient
(c) Necessary and sufficient
(d) all of the above

1.2.e If $f(z) = \sin\left(\frac{1}{z-a}\right)$, type of singularity for $z = a$ is [CO2] 1

(a) Removable
(b) Isolated essential

(c) Non isolated Essential

(d) Pole

1.2.f The function $(z-1)\sin\frac{1}{z}$ at $z = 0$ has [CO2] 1

(a) Removable singularity

(b) Essential singularity

(c) Simple pole

(d) Multiple pole

1.2.g Residue of the function $f(z) = \frac{1}{z^2(z-i)}$ at $z = i$ is [CO2] 1

(a) 2π

(b) -2π

(c) -1

(d) 1

1.3.a *The solution of PDE:* $D'(D^2 - 2DD' + D'^2)z = 0$ *is* [CO3] 1

(a) $z = f_1(y) + f_2(y+x) + xf_3(y+x)$

(b) $z = f_1(x) + f_2(y+x) + xf_3(y+x)$

(c) $z = f_1(y+x) + f_2(y+x)$

(d) *None of these*

1.3.b *The Particular integral of PDE* $(D^2 - DD' + D' - 1)z = \cos(x+2y)$ *is* [CO3] 1

(a) $z = \frac{1}{2}\cos(x+2y)$

(b) $z = \frac{1}{2}\sin(x+2y)$

(c) $z = \frac{x}{2}\sin(x+2y)$

(d) *None of these*

1.3.c *While solving a PDE Using a Variable Separable method, we equate the ratio to a Constant which?* [CO3] 1

(a) Can be Positive or Negative Integer or Zero

(b) Can be Positive or Negative rational number or Zero

(c) Must be a Positive Integer

(d) Must be a Negative Integer

1.3.d *What is the Solution of One − dimension heat equation* $\frac{\partial u}{\partial t} = c^2\frac{\partial^2 u}{\partial x^2}$ 1

when the ratio < 0? [CO3]

(a) $u = (c_1 e^{px} + c_2 e^{-px})c_3 e^{p^2c^2t}$

(b) $u = (c_1 x + c_2)c_3$

(c) $u = (c_1 Cospx + c_2 Sinpx)c_3 e^{-p^2c^2t}$

(d) *None of these*

1.3.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) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

1.3.f *Which of the following is a heat equation of 2−dimensional in steady state? [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) $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

1.3.g *If two ends of a bar of length l is insulated then what are the conditions to solve 1−d heat equation? [CO3]* 1

(a) $u_x(0,t) = u_x(l,t) = 0$

(b) $u_t(0,t) = u_t(l,t) = 0$

(c) $u_x(0,t) = u_t(l,t) = 0$

(d) *None of these*

1.4.a Using Bisection method find the root of $3x^2 = 5x + 2$ in the interval [0,3]. CO4 1

(a) 0.617

(b) 0.527

(c) 0.517

(d) 0.537

1.4.b A function $f(x)$ is given as $e^x - 3x = 0$, root between 0 and 1 using Bisection Method is: CO4 1

(a) 0.6910

(b) 0.5432

(c) 0.7432

(d) 0.8432

1.4.c The equation $f(x)$ is given as $x^3 - x^2 + 4x - 4 = 0$. Considering the initial approximation at $x = 2$ then the value of next approximation correct upto 2 decimal places is given as: CO4 1

(a) 1.33

(b) 0.67

(c) 1.54

(d) 0.68

1.4.d A function is defined as $f(x) = x^3 - x - 11 = 0$. Between the interval [2,3] find the approximate root of the function is given by: CO4 1

(a) 1.71

(b) 1.72

(c) 1.73

(d) 1.74

1.4.e Find n if $x_0 = 0.75825$, $x = 0.759$ and $h = 0.00005$: CO4 1

(a) 1.5

(b) 15
(c) 2.5
(d) 25

1.4.f Given n+1 data pairs, a unique polynomial of degree passes through the n +1 data points: CO4 1

(a) n
(b) n+1
(c) n or less
(d) n+1 or less

1.4.g 1

Value of the $\int_0^{\pi/2} \sin x\,dx$ using Trapezoidal rule is:CO4

(a) 0.9981
(b) 0.9754
(c) 0.9833
(d) 0.8976

1.5.a A takes twice as much time as B or thrice as much time as C to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in : CO 5 1

(a) 4 days
(b) 6 days
(c) 8 days
(d) 12 days

1.5.b 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 CO 5 1

(a) 81 min
(b) 108 min
(c) 144 min
(d) 192 min

1.5.c 12 buckets of water fill a tank when the capacity of each bucket is 13.5 litres. How many buckets will be needed to fill the same tank, if the capacity of each bucket is 9 litres? CO 5 1

(a) 8
(b) 15
(c) 16
(d) 18

1.5.d A train passes two bridges of lengths 500 m and 250 m in 100 seconds and 60 seconds respectively. The length of the train is CO 5 1

(a) 152 m
(b) 125 m
(c) 250 m
(d) 120 m

1.5.e A boat goes 8 km in one hour along the stream and 2 km in one hour against the stream. The speed in km/hr of the stream is CO 5 1

(a) 2
(b) 3
(c) 4
(d) 5

1.5.f Man rows downstream 32 km and 14 km upstream. If he takes 6 hours to cover each 1

distance, then the velocity (in km/h) of the current is CO 5

(a) 1/2
(b) 1
(c) 3/2
(d) 2

1.5.g 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 CO 5 1

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

SECTION B 10 X 3 = 30

2. Answer any TEN of the following:-

2.1.a Show that the function $f(z) = |z|^2$ is differentiable at origin ? (CO 1) 2

2.1.b Find the fixed points under the transformation $w = \frac{2z-5}{z+4}$. (CO1) 2

2.2.a *Evaluate*: $\oint_C \frac{e^z}{z^2+1} dz$; $C \equiv z = \frac{3}{2}$. [CO2] 2

2.2.b *Expand* $\frac{\sin z}{z-\pi}$ *about* $z = \pi$. [CO2] 2

2.2.c *Evaluate*: $\int_0^{2\pi} \frac{d\theta}{5-3\cos\theta}$ [CO2] 2

2.3.a *Find the P.I. of* $(2D^2 - 3DD' + D'^2)z = e^{x+2y}$ [CO3] 2

2.3.b *Solve* $\frac{\partial u}{\partial x} = 3\frac{\partial u}{\partial t}$ *using method of separation of variable*.[CO3] 2

2.3.c *Write down the two − dimensional heat equation in steady state*.[CO3] 2

2.4.a Find the polynomial interpolating the data: 2

x :	0	1	2
$f(x)$:	0	5	2

[CO4]

2.4.b Write Newton's forward formula up to 3rd finite differences. [CO4] 2

2.5.a Dev completed the school project in 20 days. How many days will Arun take to complete the same work if he is 25% more efficient than Dev? CO 5 2

2.5.b A man can do a job in 15 days. His father takes 20 days and his son finishes it in 25 days. How long will they take to complete the job if they all work together? CO 5 2