SDM College of Engineering & Technology, Dharwad-02

Department of Mathematics

Academic Year: 2021-2022.

Minutes of meeting

IQAC was held on 21/4/2022 in the department of Mathematics, SDMCET, Dharwad to discuss the Internal Assessment question paper I / II / III of IV semester UG in the subject Engineering Mathematics-IV with Subject Code 18UMAC400.

The following were observed/discussed

1. 2(a) $\Longleftrightarrow$ 3(b)
2. conformal transformation $w = e^z$
3. CO 2(a) 1 3(b) 2
4. ———

Sl.No	Member's present	Signature
1	S. S. Shirkol	
2	P S Badiger	PSB
3	Preeti B. J.	

Joshi 21/04/22.

Dr.Varsha D.Joshi

IQAC Co-ordinator

Jenifer u 25.04.22.

Dr.Jenifer J.Karnel

Chairman IQAC

Department of Mathematics

S.D.M. COLLEGE OF ENGINEERING & TECHNOLOGY, DHARWAD-02

DEPARTMENT OF MATHEMATICS

Internal Assessment- I

Class: IV Semester [All Branches]
Course Title: Engineering Mathematics-IV
Course Code: 18UMAC400
Course Instructors: DPB/SSS/ PSB/PBJ/VJ/BH/SK

Date: 25-04-2022
Time: 09.30AM-10.30AM
Max. Marks: 20

Note: (i) Attempt either Q.No.1 or Q. No.2.
(ii) Q.No.3 is compulsory.

Q.No.1(a) State and Prove the necessary condition for $f(z)$ to be analytic in Cartesian form. **5M**

Q.No.1(b) Find the bilinear transformation which maps the points $z:(-1,0,1)$ into $w:(0,i,3i)$. **5M**

OR

Q.No.2(a) Discuss the conformal transformation of $w=z^2$. e^z **5M**

Q.No 3(b)

Q.No.2(b) Given $u=e^{2x}(x\cos 2y - y\sin 2y)$, construct the analytic function $f(z)$ by Milne-Thomson's method. **5M**

Q.No.3(a) Show that $v=\cos x \sinh y$ is harmonic and find its harmonic conjugate. **5M**

Q.No.3(b) If $f(z)$ is an analytic function of z then prove that $\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]|\text{Re } f(z)|^2 = 2|f'(z)|^2$ **5M**

Q.No 2(a)

Q.No	1.(a)	1.(b)	2.(a)	2.(b)	3.(a)	3.(b)
CO	1	2	1	1	1	2

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OR

Q.No.2(a) If $f(z)$ is an analytic function of z then prove that $\left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]|\text{Re } f(z)|^2 = 2|f'(z)|^2$. 5M

Q.No.2(b) Given u=$e^{2x}(x\cos 2y - y\sin 2y)$, construct the analytic function $f(z)$ by Milne-Thomson's method. 5M

Q.No.3(a) Show that $v=\cos x \sinh y$ is harmonic and find its harmonic conjugate. 5M

Q.No.3(b) Discuss the conformal transformation of $w=e^z$. 5M

Q.No	1.(a)	1.(b)	2.(a)	2.(b)	3.(a)	3.(b)
CO	1	2	1	1	1	2

SDM College of Engineering & Technology, Dharwad

Department of Mathematics

Internal Assessment - I

Date: 25-04-2022

Sem: IV Scheme of Valuations Course code: 18UMAC400

Max Marks: 20

Note: Marks to be given for alternative method

1 (a) Statement — 1M

Proof — 4M

1 b) $w = \frac{az+b}{cz+d}$ be BLT

$z=-1,\ w=0 \Rightarrow -a+b=0$

$z=0,\ w=i \Rightarrow b-di=0$

$z=1,\ w=3i \Rightarrow a+b-3ic-3id=0$ — 3M

Solving $a=i,\ b=i,\ d=1,\ c=-1/3$ — 2M

2 a) $f(z)=u+iv$, $|Ref(z)|^2=u^2$ — 1M

$\frac{\partial^2(u^2)}{\partial x^2} = 2\left(\frac{\partial u}{\partial x}\right)^2 + 2u\frac{\partial^2 u}{\partial x^2}$; $\frac{\partial^2(u^2)}{\partial y^2} = 2\left(\frac{\partial u}{\partial y}\right)^2 + 2u\frac{\partial^2 u}{\partial y^2}$ — 2M

$\therefore \left[\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right]|Ref(z)|^2 = 2|f'(z)|^2$ — 3M

2 b) $u_x = e^{2x}(\cos 2y + 2x\cos 2y - 2y\sin 2y)$ — 1M

$u_y = -e^{2x}(2x\sin 2y + 2y\cos 2y + \sin 2y)$ — 1M

$f'(z) = u_x - iu_y$, Put $x=z,\ y=0$ — 1M

$= e^{2z}(1+2z) \Rightarrow f(z) = ze^{2z} + c$ — 2M

3 a) $v = \cos x \sinh y$

$v_{xx} = -\cos x \sinh y$; $v_{yy} = \cos x \sinh y$

$\Rightarrow v_{xx} + v_{yy} = 0$ v is harmonic — 2M

By C-R eqns; $u_x = \cos x \sin y$; $u_y = \sin x \sinh y$

$\Rightarrow u = \sin x \cosh y + f(y)$; $u = \sin x \cosh y + g(x)$

$\Rightarrow f(y)=0$; $g(x)=0 \Rightarrow u = \sin x \cosh y$

$f(z) = u+iv = \sin z$ — 3M

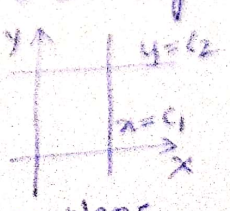
3 b) $w = e^z \Rightarrow u = e^x\cos y$, $v = e^x \sin y$

$u^2+v^2 = e^{2x}$, $v/u = \tan y$ — 2M

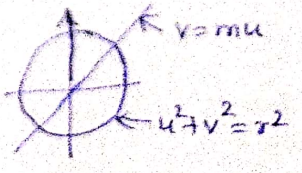
I) $x = c_1 \Rightarrow u^2+v^2 = r^2$

II) $y = c_2 \Rightarrow v = mu$

— 2M



z-plane



w-plane — 1M