

12/14
14

B.Sc. in EEE, 2nd Semester
BSc.TE(II), 1st Semester
2nd

May 15, 2023
Time: 10.00 AM – 1.00 PM

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

Semester Final Examination	Summer Semester, A. Y. 2021-2022
Course No.: Math 4221/Math 4629	Time: 3 Hours
Course Title: Mathematics III	Full Marks: 150

There are 6 (six) questions. Answer all 6 (six) questions. The symbols have their usual meanings. Programmable calculators are not allowed. Marks of each question and corresponding COs and POs are written in the brackets.

1. (a) Find the rate of change of $\phi = x^2yz + 4xz^2$ at P (1,1,1) in the direction of the vector $\mathbf{a} = \mathbf{i} + \mathbf{j} + \mathbf{k}$. Also find the maximum rate of change of ϕ . 12 (CO1, PO1)
- (b) Evaluate the surface integral $\iint_S \mathbf{F} \cdot \mathbf{n} \, dS$ where $\mathbf{F} = z\mathbf{i} + \mathbf{j} + y\mathbf{k}$ and S is the part of the plane $x + y + z = 1$ which is located in the first octant, using projection on the yz plane. 13 (CO1, PO1)
2. (a) State and prove Gauss divergence theorem. 12 (CO2, PO2)
- (b) Show that $|z - i| + |z + i| = 1$ represents hyperbola. 13 (CO2, PO2)
3. (a) Find the mapping of x-axis under the transformation $w = \frac{i - z}{i + z}$ onto the w-plane 12 (CO2, PO2)
- (b) Define analytic function. Is the function $f(z) = |z|^4$ analytic. Formulate Cauchy- Riemann equations in polar form. 13 (CO1, PO1)

12

4. (a) Show that $u = e^{-2xy} \sin(x^2 - y^2)$ is harmonic. Find its harmonic conjugate v and express $f(z) = u + iv$ in terms of z . (CO1, PO1)

- (b) State and prove Cauchy's integral theorem. Evaluate $\int_C \frac{z+5}{z^3+8z^2+15z} dz$ if the contour C is the circle $|z-2|=1$. 13 (CO1, PO2)

5. (a) Evaluate $\int_C \frac{z^2-2z}{(z+1)^2(z^2+3z-4)} dz$ where C is the circle $|z|=2$ 12 (CO1, PO2)

- (b) Find the regression line of X on Y from the following data and find X when $Y=5$. 13 (CO3, PO1)

X	2.3	2.5	3.9	3.6	4.1	3.2	1.4	1.1
Y	8.6	8.1	7.6	7.8	7.4	6.6	5.2	6.1

6. (a) Define Binomial probability distribution. Why the name of the probability distribution is Binomial? 12 (CO3, PO2)
Twenty percent of the tools produced in a certain manufacturing process turn out to be defective. Find the probability that in a sample of 15 tools chosen at random (i) more than thirteen (ii) at least two will be defective by using Binomial distribution.

- (b) Explain Gaussian probability distribution. 13 (CO3, PO2)
A manufacturer knows from experience that the resistance of resistors is normally distributed with mean 50 ohms and standard deviation 1 ohms. Measure the percentage of resistors which will have resistance between 49 ohms and 51 ohms?