OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (All Branches) II-Semester (Main) Examinations
August/September 2022

ENGINEERING MATHEMATICS-II

Time : 3 hours **Max. Marks : 70**

Note : i) Answer **Question No. 1** (Compulsory) and answer any **four questions** from the remaining questions (2- 7).

ii) Answers must be written in same order as they occur in the Question Paper.

iii) **Missing data, if any, may suitably be assumed.**

		Marks	BT	CO
1. a)	Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$	2	4	1
b)	Solve $(hx + by + f)dy + (ax + hy + g)dx = 0$	2	3	2
c)	Find the Particular Integral of $(D^2 + 6D + 9)y = 5e^{3x}$	2	2	3
d)	Determine whether $\frac{1}{z}$ is analytic or not.	2	5	4
e)	For the conformal transformation $w = z^2$, find the coefficient of magnification at $z = 2 + i$	2	1	5
f)	Define Cauchy's Residue Theorem.	2	6	5
g)	Find Integrating factor of $(2x \log x - xy)dy + 2y\, dx = 0$	2	5	2
2. a)	Find the values of k such that the system of equations $x + ky + 3z = 0$, $4x + 3y + kz = 0$, $2x + y + 2z = 0$ has non-trivial solution.	7	4	1
b)	Reduce the following Quadratic form into "Sum of squares" by an orthogonal transformation and give the matrix of transformation $x^2 + 2y^2 - 7z^2 - 4xy + 8xz$ and discuss with nature.	7	3	1
3. a)	Find the orthogonal trajectory of family of curves $r^n \sin n\theta = a^n$	7	4	2
b)	Solve $y^1 + y \tan x = \cos x$, $y(0) = 0$	7	5	2

4. a) Solve $(x^2D^2 - xD - 3)y = x^2 \log x$ 7   2   3

b) Using the Method of Variation of Parameters   7   3   3
solve $\frac{d^2y}{dx^2} + 4y = \tan 2x$

5. a) Use Cauchy's Integral formula to evaluate   7   5   4

$\int_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)} \, dz$, where C is the circle $|z| = 3$

b) Show that $e^x(x \cos y - y \sin y)$ is a harmonic function. Find the   7   1   4
analytic function for which $e^x(x \cos y - y \sin y)$ is imaginary part.

6. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ 7   6   5
into the points $w = i, 0, -i$

b) Find the residue of $\frac{z^3}{(z-1)^4(z-2)(z-3)}$ at a pole of order 4   7   4   5

7. a) Evaluate $\int_c \frac{e^{2z}}{(z+1)^4} dz$ around $c: |z - 1| = 3$ 7   3   4

b) $\int_C \frac{1-2z}{z(z-1)(z-2)} dz$, where c is the circle $|z| = 1.5$ by using Cauchy's   7   6   5
Residue Theorem.

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