

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 $y' + y \tan x = \cos x$, $y(0) = 0$	7	5	2

(P.T.O.)

4. a) Solve $(x^2 D^2 - xD - 3)y = x^2 \log x$ 7 2 3
- b) Using the Method of Variation of Parameters solve $\frac{d^2 y}{dx^2} + 4y = \tan 2x$ 7 3 3
5. a) Use Cauchy's Integral formula to evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)(z-2)} dz$, where C is the circle $|z| = 3$ 7 5 4
- b) Show that $e^x(x \cos y - y \sin y)$ is a harmonic function. Find the analytic function for which $e^x(x \cos y - y \sin y)$ is imaginary part. 7 1 4
6. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$ 7 6 5
- 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 Residue Theorem. 7 6 5

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