OSMANIA UNIVERSITY
FACULTY OF ENGINEERING
UNIVERSITY COLLEGE OF ENGINEERING (AUTONOMOUS)
B.E. (All Branches) II-Semester (Main) Examinations. October 2021

ENGINEERING MATHEMATICS-II

Time : 2 hours   Max. Marks : 70

Note : i)   First Question is compulsory which carries 16 marks and it consists of 7 sub questions((a-g) and answer any 4 sub questions.
  ii) Answer any Three questions from the remaining six questions (2-7). Each question carries 18 Marks.
  iii) Missing data, if any, may suitably be assumed.

			Marks	BT	CO
1. a)	Find the rank of the matrix $A = \begin{bmatrix} 0 & 1 & -3 \\ 1 & 0 & 1 \\ 3 & 1 & 0 \end{bmatrix}$		4	1	1
b)	Check whether the following vectors are linearly dependent or not. If so, find the relation between them. $x_1 = (1,3,4,2), \quad x_2 = (3,-5,2,2), \quad x_3 = (2,-1,3,2)$		4	4	1
c)	Find the orthogonal trajectories of the family of curves $y = ce^x$, c is parameter.		4	2	2
d)	Show that x, x^2, x^3 are linearly independent on any interval I. https://www.osmaniaonline.com		4	1	3
e)	Find the constants a, b such that the function $f(z) = x - 2ay + i(bx - ay)$ is analytic.		4	5	4
f)	Expand $f(z) = \frac{1}{z}$ about $z = 2$ in Taylor's series.		4	6	5
g)	Solve $y'' + 2y' + 2y = 0$		4	3	3
2. a)	Solve the system of equations $4x + 2y + z + 3w = 0$ $6x + 3y + 4z + 7w = 0$ $2x + y + w = 0$		9	6	1
b)	Using Cayley-Hamilton theorem, find A^8, if $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$		9	3	1
3. a)	Solve $y' + 4xy + xy^3 = 0$.		9	3	2
b)	Find the general solution of the differential equation $y' = y^2 - (2x - 1)y + x^2 - x + 1$, if $y = x$ is solution of the equation.		9	5	2

4. a) Using the method of variation of parameters. solve $y'' + y = cosecx$ 9   4   3

b) Solve $(D^2 - 4)y = 2cos^2x$.   9   6   3

5. a) Evaluate $\int \frac{z^2+1}{z(2z-1)}dz$, $C:|z| = 1$, using Cauchy's integral formula.   9   5   4

b) Show that $u(x,y) = 2x + y^3 - 3x^2y$ is harmonic, find its harmonic conjugate and corresponding analytic function $f(z)$.   9   2   4

6. a) Expand $f(z) = \frac{1}{z^2-3z+2}dz$ in the region $(i) 0 < |z - 1| < 2$ $(ii) 1 < |z| < 2$ 9   4   5

b) Find the Bilinear Transformation which maps the points $-1, 0, 1$ in the z-plane onto the points $1, i, -1$ in the w-plane.   9   6   5

7. a) Evaluate the integral $I = \int_0^{2\pi} \frac{d\theta}{1-2acos\theta+a^2}$ where a is the complex constant and (i) $|a| < 1$ (ii) $|a| > 1$ 9   5   4

b) Solve $2x^2y'' + 3xy' - 3y = x^3$ 9   3   3

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