KANPURINSTITUTEOFTECHNOLOGY

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EVEN SEM SUMMATIVEEXAM, AY: 2024-25	PROGRAM: B. TECH	ROLLNO: 24165013L001
SUBJECTCODE: AH12010	BRANCH: CS/IT/AIML/EC/EN/ME	SECTION: A/B/C/D
SUBJECTNAME: ENGINEERING MATHS-II	SEMESTER: II	FACULTYNAME: DR NEETU SINGH

Time: 2hrs *Total Marks: 30*

Note: Attempt all Sections

Attempt all questions for CO1

	Attempt all questions 02 x 01=02	BL
1a.	Find the DE which represents the family of straight lines passing through the origin.	1
1b.	Find the particular integral (PI) of $(D-1)^2y = e^x$	3

	Attempt any one question 01x 04=04	BL
2a.	Solve: $(D^2 - 2D + 4)y = e^x \cos x + \sin x \cos 3x$ OR Solve: $(D^3 - 1)y = 3x^4 - 2x^3$	3
2b.	Solve: $\frac{d^2x}{dt^2} + y = \sin t$ and $\frac{d^2y}{dt^2} + x = \cos t$ OR Solve: $\frac{d^2y}{dx^2} + a^2y = \sec ax$	3

Attempt all questions for CO2

	Attempt all questions 02 x 01=02	BL
3a.	Define Linear Transformation.	2
3b.	Define Dimension.	2

	Attempt any one question 01x 04=04	BL
4a.	Show that function $T: R^3 \to R^2$ defined by $T(x, y, z) = (x + y + 2z, x + z + 1)$ is not a linear transformation OR Investigate for what values of λ, μ the simultaneous equations $x + y + z = 6, x + 2y + 3z = 10$, and $x + 2y + \lambda z = \mu$ have (i) No solution (ii) a unique solution (iii) an infinite number of solution	3
4b.	Show that the set $\{1, x, 1 + x + x^2\}$ is linearly independent set of vectors in the vector space of all polynomial over the real number field. OR Write the vector $u = (1, -2, 5)$ as a linear combination of vectors $u_1 = (1,1,1), u_2 = (1,2,3), u_3 = (2, -1, 1)$ in a vector space $R^3(R)$.	3

Attempt all questions for CO3

	Attempt all questions 02 x 01=02	BL
5a.	Define D'Alembert Test.	2
5b.	Discuss the convergence of the sequence u_n, where $u_n = \sin\left(\frac{1}{n}\right)$	3

	Attempt any one question 01x 04=04	BL
6a.	Test the convergence of the series $\frac{1}{1 \cdot 2 \cdot 3} + \frac{x}{4 \cdot 5 \cdot 6} + \frac{x^2}{7 \cdot 8 \cdot 9} + \cdots$, where $x \epsilon R$ OR Test the convergence of the series whose n^{th} term is $\frac{1}{n}\sin\left(\frac{1}{n}\right)$	3
6b.	Find the half range cosine series for the function $f(x) = (x-1)^2$ in the interval (0,1). Hence prove that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} + \cdots = \frac{\pi^2}{8}$ OR Find the FS of the function $f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & o < x < \pi \end{cases}$ also deduce that $\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \cdots$	3

Attempt all questions for CO4

	Attempt all questions 02 x 01=02	BL
7a.	Define analytic function with example.	2
7b.	Show that the function $f(z) = \|z\|^2$ is not analytic at origin.	3

	Attempt any one question 01x 04=04	BL
8a.	Determine an analytic function $f(z)$ in terms of z whose real part $u(x, y)$ is $e^x(x\cos y - y\sin y)$ and $f(1) = e$. OR Show that $v(x, y) = e^{-x}(x\cos y + y\sin y)$ is harmonic. Find its harmonic conjugate.	3
8b.	Find the image of $\|z - 2i\| = 2$ under the mapping $w = \frac{1}{z}$ OR Find the bilinear transformation which maps the points $i, -i, 1$ of the $z - plane$ into $0, 1, \infty$ of $w - plane$ respectively.	3

Attempt all questions for CO5

	Attempt all questions 02 x 01=02	BL
9a.	Discuss the singularity of $\sin\left(\frac{1}{z-a}\right)$	3
9b.	State Cauchy's Integral Theorem.	2

	Attempt any one question 01x 04=04	BL
10a.	Evaluate the integral using Cauchy Integral formula: $\oint \frac{e^z}{z(1-z)^3} dz, \|z\| = \frac{1}{2}$ OR Evaluate the integral using Cauchy Integral formula: $\oint \frac{z^2+1}{(z^2-1)} dz$, where $\|z\| = \frac{3}{2}$	3
10b.	Expand $f(z) = \frac{7z-2}{z^3-z^2-2z}$, in the region (i) $\|z\| < 1$ (ii) $1 < \|z\| < 2$ (iii) $\|z\| > 2$ OR Find the Taylor's and Laurent's series which represent the function $f(z) = \frac{z^2-1}{(z+2)(z+3)}$ when (i) $\|z\| < 2$ (ii) $2 < \|z\| < 3$ (iii) $\|z\| > 3$	3