APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY

08 PALAKKAD CLUSTER

Q. P. Code: PE0821111-I **(Pages: 3)** **Name: ....**

Reg. No:...................................

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2021

Branch: Electrical and Electronics Engineering **Specialization: Power Electronics**

08EE6211 Applied Mathematics

(Common to PE)

Time:2 hour 15 minutes **Max.Marks: 60**

Answer all six questions.

Modules 1 to 6: Part 'a' of each question is compulsory and answer either part 'b' or part 'c' of each question.

Q. No.	Module 1	Marks
1.a	Check whether S=$\{x_1 = (1,2,-3), x_2 = (1,-3,2), x_3 = (2,-1,5)\}$ is a set of linearly independent vectors in $\mathbb{R}^3$	3
	Answer b or c	
b	Check whether S=$\{x_1 = (2,6,3), x_2 = (9,1,0), x_3 = (1,2,7)\}$ is a basis of $\mathbb{R}^3$	6
c	Let W be the subspace of $\mathbb{R}^4$ spanned by $x_1 = (1,2,1,-2), x_2 = (2,3,2,-3)$ and $x_3 = (2,5,2,-5)$. Find a basis for $W$and the dimension of W	6

Q. No.	Module 2	Marks
2.a	Solve the following differential equation $r sin\Theta\, d\Theta + (r^3 - 2r^2 cos\Theta + cos\Theta)\, dr = 0$	3
	Answer b or c	
b	Solve $y'' + 4y' + 4y = 3\sin x + 4\, cos x$, $y(0) = 1$ and $y'(0) = 0$	6
c	Solve $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + y = \log x \left[\frac{\sin(\log x)+1}{x}\right]$	6

Q. No.	Module 3	Marks

3.a	Obtain the fourier sine transform of $f(x) = \sin x$ for $0 < x < a$ $= 0$ for $x > a$	3
	Answer b or c	
b	Expand $f(x) = \sqrt{1 - \cos x}$, $0 < x < 2\Pi$ in a fourier series. Hence evaluate $\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \cdots$	6
c	Find the Fourier series expansion for $f(x)$ if $f(x) = -\Pi$ for $-\Pi < x < 0$ $= x$ for $0 < x < \Pi$ Deduce that $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \cdots = \frac{\Pi^2}{8}$	6

Q. No.	Module 4	Marks
4.a	Find the constants a, b, c, d and e if $f(z) = (ax^4 + bx^2y^2 + cy^4 + dx^2 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic	3
	Answer b or c	
b	Evaluate using Cauchy's integral formula i) $\oint \frac{e^{2z}}{(z+i)^4} dz$ over the circle $\lvert z \rvert = 3$ ii) $\oint \frac{\cos \Pi z}{z^2 - 1} dz$ around a rectangle with vertices $2 \pm i$, $-2 \pm i$	6
c	Find the Taylor's series expansion of $f(z) = \frac{1}{(z+1)^2}$ about $z = -i$	6

Q. No.	Module 5	Marks
5.a	Find the Laurent's expansion of $f(z) = \frac{7z-2}{z(z+1)(z-2)}$ in the region $1 < z + 1 < 3$	4
	Answer b or c	

Q. No.		Marks
b	i) Determine the residue at each pole of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ Hence evaluate $\oint f(z)dz$ over the circle $\|z\| = 2.5$ ii) Evaluate using residue theorem $\oint \frac{\sin\Pi z^2+\cos\Pi z^2}{(z-1)(z-2)} dz$ over the circle $\|z\| = 3$	8
c	i) Find the bilinear transformation which maps the points $z = 1, i, -1$ on to the points $w = i, 0, -i$. Hence find image of $\|z\| < 1$ ii) Under the transformation $w = \frac{1}{z}$, find the image of $\|z - i\| = 2$	8

Q. No.	Module 6	Marks
6.a	List the techniques for solving unconstrained minimization problems?	4
	Answer b or c	
b	Explain Random Walk method with direction exploitation of solving unconstrained minimization method with a neat flow chart.	8
c	Explain Random jumping method with a neat flow chart for the general iterative scheme of unconstrained minimization problem	8