APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY
08 PALAKKAD CLUSTER

Q. P. Code : PE0821118 **(Pages: 3)** **Name ....**

Reg. No: ....

FIRST SEMESTER M.TECH. DEGREE EXAMINATION DECEMBER 2018

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

08EE 6211 APPLIED MATHEMATICS

Time:3 hours **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.

(Add any other instruction specific to course here like the use of IS codes/design tables etc.)

Note: The 3 and 4 mark sub questions are compulsory for testing the knowledge on fundamental aspects. However 6 and 8 mark sub questions shall preferably be application type questions with the choice to answer any one.)

Q.no.	Module 1	Marks
1.a	Find the Eigen values and Eigen Vectors of the Matrix A = $\begin{matrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{matrix}$. State Cayley - Hamilton Theorem?	3
	Answer b or c	
b	Verify Stokes Theorem for the vector field F = (2x – y) I - y z^2 J - y z^2 K over the upper half surface of $x^2 + y^2 + z^2 = 1$ bounded by its projection in the xy – plane ?	6
c	Using Greens's theorem evaluate $\int_c \; [(y - sinx)dx + \cos x\, dy]$ where C is the plane Triangle enclosed by the lines y = 0 , x = $\frac{\pi}{2}$ and y = $\frac{\pi}{2}x$.	6

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Q.no.	Module 2	Marks
2.a	Solve $\frac{d^2 y}{dx^2} - 3\frac{dy}{dx} + 2y = x e^x + \sin 2x$	3
	Answer b or c	
b	Solve $(1+x^2)\frac{d^2 y}{dx^2} + (1+x)\frac{dy}{dx} + y = 2\sin[\log(1+x)]$	6
c	Solve the Bernoulli' s Linear equation $xy(1+xy^2)\frac{dy}{dx} = 1$	6

Q.no.	Module 3	Marks
3.a	Find a Fourier series to represent x - x^2 from x = (- π) to (π)	3
	Answer b or c	
b	Find the Fourier Cosine transform of : { " x " , for $0 < x < 1$, " 2 – x" for $1 < x < 2$ and " 0 " for $x > 2$ }	6
c	A sinusoidal voltage $E\sin\omega t$, where t is the time , is passed through a half wave rectifier that clips the negative portion of the wave . Find the Fourier series of the resulting periodic function $u(t) = 0$ if $-L < t < 0$ $E\sin\omega t$ if $0 < t < L$	6

Q.no.	Module 4	Marks
4.a	Expand $\log_e x$ in powers of (x-1) using Taylor's Series and hence evaluate $\log_e 1.1$ correct to 4 decimal places ?	3
	Answer b or c	
b	Show that $\int_0^{2\pi} \frac{\cos 2\theta \, d\theta}{1-2a\cos\theta + a^2} = \frac{2\pi a^2}{1-a^2}$, ($a^2 < 1$)	6
c	Evaluate $\oint_C \frac{e^z}{\cos \pi z} dz$, where C is the unit circle $\lvert z \rvert = 1$	6

Q.no.	Module 5	Marks
5.a	State and prove Nikolai Jegrovich Joukowski Transformation in Conformal Mapping with application to design of an Aerofoil ?	4
	Answer b or c	
b	Prove that the function f (z) defined by $f(z) = \frac{x^3(1+i) - y^3(1-i)}{x^2+y^2}$ ($z \neq 0$) f(0) = 0 is continuous and the Cauchy Riemann equations are satisfied at the origin yet f '(0) does not exist .	8
c	Evaluate $\oint_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)^2(z-2)} dz$ where C is the circle $\lvert z \rvert = 3$	8

Q.no.	Module 6	Marks
6.a	Minimize $f(x, y) = k x^{-1} y^{-2}$ subject to $g(x, y) = x^2 + y^2 - a^2$ using Langrange's function ?	4
	Answer b or c	
b	Minimize $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$ using Gradient Method starting from the point $x_1 = \{ \begin{matrix} 0 \\ 0 \end{matrix} \}$?	8
c	Draw and explain the optimisation algorithm for (1) Univariate Direct Search method (2) Newton's Descent Method ?	8