

**APJ ABDULKALAM TECHNOLOGICAL UNIVERSITY  
08 PALAKKAD CLUSTER**



Q. P. Code :PE0819211-I

(Pages: 2)

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

**FIRST SEMESTER M.TECH. DEGREE EXAMINATION December 2019**

Branch: Electrical & Electronics Engineering

Specialization: Power Electronics

**08EE6211 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.)

Q.no.	Module 1	Marks
1.a	Analyze whether V is a vector space over the field F where F is the set of real numbers and Vis the set of all ordered triplets of real numbers, given: $x + y = (x_1 + y_1, x_2 + y_2, x_3 + y_3)$ and $ax = (ax_1, ax_2, 0)$	3
<b>Answer b or c</b>		
b	Explain the concept of inner product space. Hence show that $\langle x, y \rangle = x_1\overline{y_1} + x_2\overline{y_2} + \dots + x_n\overline{y_n}$ is an inner product in $F^n$ where F represents the field of real numbers.	6
c	Deduce an orthonormal basis using Gram Schmidt orthogonalization process given the basis $S = \{x_1 = (2, 4, -4), x_2 = (-3, 6, 0), x_3 = (7, 2, 1)\}$	6
Q.no.	Module 2	Marks
2.a	Solve the differential equation $\cos x \, dy = y(\sin x - y)dx$ .	3
<b>Answer b or c</b>		
b	Determine the overall solution of the differential equation given below. $(3x + 2)^2 \frac{d^2y}{dx^2} + 3(3x + 2) \frac{dy}{dx} - 36y = 3x^2 + 4x + 1$ .	6
c	Solve the differential equation $x^2 \frac{d^2y}{dx^2} + 4x \frac{dy}{dx} + 2y = e^x$ .	6
Q.no.	Module 3	Marks

3.a Express  $f(x) = x$ ;  $0 < x < 2$  as half range cosine series. 3

**Answer b or c**

b State the conditions for the existence of Fourier series. Expand  $f(x) = x \sin x$  as Fourier series in the interval  $0 < x < 2\pi$ . 6

c Solve the integral equation  $\int_0^\infty f(\theta) \cos \alpha \theta d\theta = 1 - \alpha$ ;  $0 \leq \alpha \leq 1$   
 $= 0$  ;  $\alpha > 1$ . 6

Hence evaluate  $\int_0^\infty \frac{\sin^2 t}{t^2} dt$ .

Q.no.	Module 4	Marks
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4.a Expand  $f(z) = \frac{1}{z^2 - z - 6}$  by Taylor series about  $z = -1$ . 3

**Answer b or c**

b Evaluate  $\int_0^{2+i} (\bar{z})^2 dz$  along the real axis to 2 and then vertically to 2+i and also along the line  $2y = x$ . 6

c State and prove Cauchy's integral theorem. Hence evaluate  $\oint \frac{\sin^2 z}{(z - \pi/6)^3} dz$  over the unit circle. 6

Q.no.	Module 5	Marks
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5.a Find the Laurent's series expansion of  $\frac{1}{z - z^3}$  in  $1 < |z+1| < 2$ . 4

**Answer b or c**

b Using Cauchy's residue theorem evaluate  $\oint \frac{30z^2 - 23z + 5}{(2z-1)^2(3z-1)}$  where  $C$  is  $|z| = 1$ . 8

c Find the image of half plane  $\text{Re}(z) \geq 2$  under the mapping  $w = iz$ . 8

Q.no.	Module 6	Marks
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6.a Write short notes on gradient search methods. 4

**Answer b or c**

b Explain in detail Gomory cutting plane method for integer programming problems with an example. 8

c Minimize  $f(x_1, x_2) = x_1 - x_2 + 2x_1^2 + 2x_1x_2 + x_2^2$  using steepest descent method. 8