ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END SEMESTER EXAMINATION** (Academic Session: 2020 – 21)		
Name of the Program:	B.Tech	**Semester:**	II
Paper Title:	Engineering mathematics II	**Paper Code:**	MTH11502
Maximum Marks:	50	**Time Duration:**	3 Hrs
Total No. of Questions:	17	**Total No of Pages:**	

1. At top sheet, clearly mention Name, Univ. Roll No., Enrolment No., Paper Name & Code, Date of Exam.
2. All parts of a Question should be answered consecutively. Each Answer should start from a fresh page.
3. Assumptions made if any, should be stated clearly at the beginning of your answer.

Group A **Answer All the Questions (5 x 1 = 5)**			
1	What is Cayley-Hamilton theorem.	**R**	**CO1**
2	Define basis of a vector space.	**R**	**CO2**
3	Define analytic function.	**R**	**CO3**
4	Define periodic function with an example.	**R**	**CO4**
5	Find the Z-transform of $f(n) = n\,a^n$.	**R**	**CO5**
Group B **Answer Allthe Questions (5 x 2 = 10)**			
6 a)	What is the value of a for which the following system of equations has unique solution? $x + y + z = 1$ $x + 2y - z = 2$ $5x + 7y + az = 4$	**R**	**CO1**
	(OR)		
6 b)	Find whether the following two matrices are similar or not: $A = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$	**R**	**CO1**
7 a)	Show that the following vectors are linearly independent: $(1, 2, 0), (2, 3, 4)$ and $(1, 5, -2)$	**U**	**CO2**
	(OR)		
7 b)	Let the vector addition in $\mathbb{R}^2 = \{(x, y) \mid x, y \in \mathbb{R}\}$ be defined by$(x_1, y_1) + (x_2, y_2) = (x_1 + x_2, y_1 + y_2)$. Show that the first five conditions of the vector space related to vector addition are satisfied.	**U**	**CO2**
8 a)	Find the singularity of the complex valued function $f(z) = \frac{e^z}{(z-2)^2}$ at $z = 2$.	**R**	**CO3**
	(OR)		
8 b)	Find the value of the integral $\oint_C \frac{z^2-z+1}{z-1}\,dz$ where C is the circle $\lvert z \rvert = \frac{1}{2}$.	**R**	**CO3**

9 a)	Explain convergence of Fourier Series.	**U**	**CO4**
	(OR)		
9 b)	Construct half-range Cosine series of a function $f(x)$ defined in an interval (0 , T)	**AP**	**CO4**
10 a)	Find the Fourier sine transforms of $f(x) = 5e^{-3x} - 7e^{-4x}$.	**R**	**CO5**
	(OR)		
10 b)	Find the function whose Fourier sine transform is $f_s(s) = \frac{e^{-as}}{s}$	**R**	**CO5**
	Group C **Answer Allthe Questions (7 x 5 = 35)**		
11 a)	Find the eigen values and eigen vectors of the following matrix: $A = \begin{pmatrix} 1 & 1 & 1 \\ -1 & -1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$	**R**	**CO1**
	(OR)		
11 b)	Use Cayley-Hamilton theorem to find inverse of the following matrix (if exist): $A = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 2 & 1 \\ 2 & 3 & 2 \end{pmatrix}$	**R**	**CO1**
12 a)	Express $(4,3,10)$ as linear combination of the vectors $(1,2,0), (2,3,4)$ and $(1,5,-2)$.	**R**	**CO2**
	(OR)		
12 b)	Show that the following set of vectors constitute a basis for the vector space $\mathbb{R}^3$with usual vector addition and scaler multiplication: $S = \{(1,1,0), (1,0,1), (0,1,1)\}$	**U**	**CO2**
13 a)	Show that the complex valued function $f(z) = \|z\|^2$ is analytic only at $z = 0$.	**R**	**CO3**
	(OR)		
13 b)	Show that the complex valued function $f(z) = \sqrt{\|xy\|}$ is not differentiable at $z = 0$ but the Cauchy-Riemann equation is satisfied there.	**R**	**CO3**
14 a)	Find Fourier Series for $\|x\|$ in the interval $[-\pi, \pi]$.	**R**	**CO4**
	(OR)		
14 b)	Find half range sine series of $\pi x - x^2$ in $(0, \pi)$ upto first three terms.	**R**	**CO4**
15 a)	Use Laplace transform to find the solution of following ordinary differential equation: $2\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 2y = e^{-2t};\ y(0) = 1, y'(0) = 1$	**R**	**CO5**
	(OR)		
15 b)	Find the Z-transform and region of convergence of the sequence $f[n] = a^n u[n]$, where $u[n]$ is the unit step sequence. (3+2)	**R**	**CO5**
16 a)	Find the value of $\oint_C \frac{sin\pi z^2 + cos\pi z^2}{(z-1)(z-2)}\, dz$ where C is the circle $\|z\| = 3$ by Cauchy's integral formula.	**R**	**CO3**
	(OR)		

16 b)	Find the value of $\oint_C \frac{3z^2+z}{z^2-1}\,dz$ where C is the circle $\lvert z-1\rvert = 1$ by Cauchy's integral formula.	**R**	**CO3**
17 a)	Show that Fourier series expansion of $f(x) = \left(\frac{\pi-x}{2}\right)^2$ is $\frac{\pi^2}{12} + \sum_{n=1}^{\infty} \frac{\cos nx}{n^2}$.	**U**	**CO4**
	(OR)		
17 b)	Obtain Fourier series of the function $f(x) = \begin{cases} 0\,, -\pi < x < 0 \\ \sin x\,, \ 0 < x < \pi \end{cases}$ Hence show that $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \cdots = \frac{1}{4}(\pi - 2)$. (3+2)	**U**	**CO4**