



FY B Sc

School of Science

Semester I

MTS 101

Mathematics I

Max Marks: 100

~~Nov 2017~~  
27 Dec

Re - End Semester Examination (ESE)

Time: 3 Hrs

Instructions for Students: 1) Use of non-programmable calculator is allowed  
2) All questions are compulsory

Que. No.	Questions	CO	Marks
Que.1	Select the correct alternative (two marks each)	All CO	16
A)	The function $f(x) = \frac{x^2 - a^2}{x - a}$ at $x = a$ is ..... a) Continuous b) Not continuous c) Undecided d) None of these	CO1	2
B)	If $f(x) = \frac{\sin x}{x}$ then Left hand limit at $x = 0$ is ..... a) 0 b) 1 c) -1 d) None of these	CO1	2
C)	The value of 'c' in Rolle's theorem for $f(x) = \cos x$ , $c$ in $(-\frac{\pi}{2}, \frac{\pi}{2})$ is ..... a) $\frac{\pi}{4}$ b) $\frac{\pi}{3}$ c) $\pi$ d) 0	CO2	2
D)	$n^{\text{th}}$ derivative of $e^{ax}$ is ..... a) $e^{ax}$ b) $a^n e^{ax}$ c) $n! e^{ax}$ d) $e^{nax}$	CO3	2
E)	$1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$ is the expansion of ..... a) $e^{mx}$ b) $a^{mx}$ c) $e^x$ d) $a^x$	CO4	2
F)	$\lim_{x \rightarrow 0} \frac{a^x - b^x}{x} = \dots\dots\dots$ a) 0 b) $\infty$ c) $\log(\frac{a}{b})$ d) $\log(a-b)$	CO5	2
G)	$e^{-i\theta} = \dots\dots\dots$ a) $\cos\theta + i\sin\theta$ b) $\cos\theta - i\sin\theta$ c) $\cos\theta + \sin\theta$ d) $\cos\theta - \sin\theta$	CO6	2
H)	$z \cdot \bar{z} = \dots\dots\dots$ a) $z$ b) $-z$ c) $ z $ d) $ \bar{z} $	CO7	2
Que.2	Attempt any Two of the following: (seven marks each)	CO1	14
a)	Define Continuous Function. Hence show that function $\cot x$ is Continuous on its domain	CO1	7
b)	Write $\epsilon - \delta$ definition of limit of function. Show that $\lim_{x \rightarrow 0} x \sin\left(\frac{1}{x}\right) = 0$	CO1	7
c)	Define Left and Right hand limit of the function Hence find	CO1	7



	value of k, if $\lim_{x \rightarrow 2} f(x)$ exist such that $f(x) = 4x-5$ if $x \leq 2$ $= x-k$ if $x > 2$		
Que.3	Attempt any Two of the following: (seven marks each)	CO2	14
a)	State and Prove Roll's Theorem	CO2	7
b)	Discuss Continuity and differentiability of function $f(x) = x \sin(1/x)$ , $x \neq 0$ $= 0$ , $x=0$ at point $x = 0$	CO2	7
c)	Show that $\frac{\sin \alpha - \sin \beta}{\cos \beta - \cos \alpha} = \cot \theta$ where $0 < \alpha < \theta < \beta < \frac{\pi}{2}$	CO2	7
Que.4	Attempt any Two of the following: (seven marks each)	CO3	14
a)	State and Prove Leibnitz theorem	CO3	7
b)	Find $n^{\text{th}}$ derivative of $y = \frac{2x+1}{(x+2)(x-3)^2}$	CO3	7
c)	Find $n^{\text{th}}$ derivative of $y = \sin x \cdot \sin 2x \cdot \sin 3x$	CO3	7
Que.5	Attempt any Two of the following: (seven marks each)	CO4	14
a)	State and Prove Taylor' theorem for expansion of functions	CO4	7
b)	Expand $(1+x)^{1/x}$ upto the term containing $x^2$	CO4	7
c)	Obtain Maclaurin expansion of $e^x$ Hence If $x = y - \frac{y^2}{2} + \frac{y^3}{3} - \frac{y^4}{4} + \dots$ then show that $y = x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!}$	CO4	7
Que.6	Attempt any Two of the following: (seven marks each)	CO5	14
a)	Show $\lim_{x \rightarrow b} \frac{x^b - b^x}{x^x - b^b} = \frac{1 - \log b}{1 + \log b}$	CO5	7
b)	Determine the value of p and q for which $\lim_{x \rightarrow 0} \frac{x(1+p \cos x) - q \sin x}{x^3} = 1$	CO5	7
c)	Evaluate $\lim_{x \rightarrow 0} \frac{x^x - x}{1 - x + \log x}$	CO5	7
Que.7	Attempt any Two of the following: (seven marks each)	CO6	14
a)	State and prove De-Moivre Theorem	CO6	7
b)	Find all values of $(1 + i\sqrt{3})^{3/4}$ and show that their product is 8	CO6	7
c)	If $\tan(x+iy) = i$ where x and y are real numbers then prove x is indeterminate and y is infinite	CO6	7
Total			100