ESE

Sanjay Ghodawat University, Kolhapur

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2018-19

FY B. Tech
FYT 114
20, May 2019 Monday

School of Technology
Complex Numbers and Calculus (Old)
End Semester Examination (ESE)

Semester II
Max Marks: 100
Time: 3 Hrs.
(10.30 to 1.30 pm)

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

		Marks	Blooms Levels	COs
Q1	**Solve the following**			
a)	Simplify, $\frac{[\cos 2\theta - i\sin 2\theta]^5[\cos 3\theta + i\sin 3\theta]^{-4}}{[\cos 5\theta - i\sin 5\theta]^3[\cos 3\theta + i\sin 3\theta]^{-2}}$.	05	L2	CO1
b)	Expand sin6θ, cos6θ and hence find tan6θ.	05	L2	CO1
c)	Solve, $x^6 + x^5 + x^4 + x^3 + x^2 + x + 1 = 0$.	06	L2	CO1
	OR			
c)	Solve $x^6 - i = 0$.	06	L2	CO1

		Marks	Blooms Levels	COs
Q2	**Attempt Any Three from the following**			
a)	If $\sin(\theta + i\phi) = r(cos\alpha + isin\alpha)$, prove that, $r^2 = \frac{1}{2}(cosh2\phi - cos2\theta)$ and $\tan\alpha = \tanh\phi.\cot\theta$.	06	L2	CO2
b)	If, $5sinhx - coshx = 5$, Find tanhx.	06	L2	CO2
c)	Prove that $sech^{-1}z = \log\left(\frac{1+\sqrt{1-z^2}}{z}\right)$.	06	L2	CO2
d)	Show that, $tan\left[ilog\left(\frac{a-bi}{a+bi}\right)\right] = \frac{2ab}{a^2-b^2}$	06	L2	CO2

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Q3	Solve the following	Marks	Blooms Levels	COs
a)	Using Comparison test, discuss the convergence of, $\frac{2.1^3+5}{4.1^5+1}+\frac{2.2^3+5}{4.2^5+1}+\cdots$.	05	L2	CO3
b)	Using D'Alembert's ratio test, discuss the convergence of $\sum_1^\infty n^4.e^{-n^2}$.	05	L2	CO3
c)	Using Cauchy's n^{th} root test, discuss the convergence of $\frac{1}{2}+\frac{2}{3}x+\left(\frac{3}{4}\right)^2x^2+\left(\frac{4}{5}\right)^3x^3+\cdots$	06	L2	CO3
	OR			
c)	Show that the harmonic series of order 'p' $\sum_{n=1}^\infty \frac{1}{n^p}=\frac{1}{1^p}+\frac{1}{2^p}+\frac{1}{3^p}+\cdots\ldots\ldots\ldots\ldots$ converges for p> 1 and diverges for, p≤ 1.	06	L2	CO3

Q4	Solve the following	Marks	Blooms Levels	COs
a)	Evaluate $\int_0^\infty \sqrt{x}\,e^{-x^2}\,dx$.	05	L3	CO4
b)	Evaluate $\int_0^1 \frac{xdx}{\sqrt{\log\left(\frac{1}{x}\right)}}$	05	L3	CO4
c)	Evaluate $\int_0^4 \sqrt{x}\,[4-x]^{\frac{3}{2}}\,dx$	06	L3	CO4
	OR			
c)	Evaluate $\int_0^\pi xsin^6xcos^4x\,dx$.	06	L3	CO4

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Q5	Attempt Any Three from the following	Marks	Blooms Levels	COs
a)	Solve $\frac{dy}{dx} = \frac{1+y^2+3x^2y}{1-2xy-x^3}$	06	L3	CO5
b)	Solve $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}} - \frac{y}{\sqrt{x}}\right)\frac{dx}{dy} = 1.$	06	L3	CO5
c)	A circuit consists of a resistance R Ohms and a condenser of C Farads connected to a constant emf E. If $\frac{q}{C}$ is the voltage of the condenser at time t after closing the circuit, show that the voltage at any time t is, $E\ \left[1 - e^{\frac{-t}{CR}}\right]$.	06	L3	CO5
d)	Find orthogonal trajectories of the family of curves $\frac{x^2}{a^2} + \frac{y^2}{b^2+\lambda} = 1$, λ being the parameter.	06	L3	CO5

Q6	Solve the following	Marks	Blooms Levels	COs
a)	Prove that, $x\text{cosec}x = 1 + \frac{x^2}{6} + \frac{7x^4}{360} + \cdots$.	05	L2	CO6
b)	Expand $2x^3 + 7x^2 + x - 1$ in powers of *(x-2)*.	05	L2	CO6
c)	Evaluate $\lim_{x\to 0}\left(\frac{1}{x^2} - cot^2x\right)$	06	L2	CO6
	OR			
c)	Evaluate $\lim_{x\to 0}\left(\frac{sinhx}{x}\right)^{\frac{1}{x^2}}$	06	L2	CO6

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