Hall Ticket Number :										

R-15

Code: 5GC41

II B.Tech. II Semester Supplementary Examinations March 2021

Complex Variables and Special Functions

(Common to EEE & ECE)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Show that $\int_0^1 \frac{x^{m-1}(1-x)^{n-1}}{(x+a)^{m+n}} = \frac{\beta(m,n)}{a^n(1+a)^m}$	7M	2	II
	b)	Find all the roots of $\sin z = 2$	7M	2	I
		OR			
2.	a)	Show that $\int_0^\infty x^n e^{-a^2x^2} = \frac{1}{2a^{n+1}}\Gamma\left(\frac{n+1}{2}\right), n > -1$	7M	2	II
	b)	Find all values of z which satisfy $\Gamma\left(\frac{n}{2}\right) = -2$.	7M	2	I
		UNIT–II			
3.	a)	Show that $f(z) = xy + iy$ is everywhere continuous but is not analytic.	7M	1	I
	b)	Find all the values of k such that $f(z) = e^x(\cos ky + i\sin ky)$ is analytic.	7M	1	I
		OR			
4.	a)	Show that the function $f(z) = \sqrt{\lvert xy \rvert}$ is not analytic at the origin, although Cauchy- Riemann equations are satisfied at the point.	7M	1	I
	b)	Find k such that $f(z) = x^3 + 3kxy^2$ may be harmonic and find its conjugate.	7M	1	I
		UNIT–III			
5.	a)	Evaluate $\int_C z^2 dz$ where C is the straight line segment from $O(z=0)$ to $A(z=2+i)$.	7M	2	V
	b)	Express $f(z) = \frac{1}{z}$ as the Taylor series at the point $z = 1$.	7M	2	II
		OR			
6.	a)	Verify Cauchy's theorem for the function $f(z) = z^2 + iz - 4$ if C is the square with the vertices at $1 \pm i$ and $-1 \pm i$.	7M	2	III
	b)	Express $f(z) = \left(\frac{1}{1-z}\right)\left(\frac{1}{(z-2)}\right)$ as the Laurent's series expansion in an annulus region $1 < \lvert z \rvert < 2$.	7M	2	II
		UNIT–IV			
7.	a)	Show that $\int_{-\infty}^{\infty} \frac{\cos ax}{x^2+1} dx = \pi e^{-a}, a \geq 0$.	7M	3	II
	b)	Show that $\int_0^\infty \frac{\cos x}{x^2+1} dx = \pi e^{-a}$. Use Rouche's theorem to identify the number of zeros of the polynomial $f(z) = 2z^4 - 2z^3 + 2z^2 + 2z + 11$, that lie inside the circle $\lvert z \rvert = 1$.	7M	3	III
		OR			
8.		Solve $\int_{-\infty}^{\infty} \frac{dx}{(x^2+a^2)(x^2+b^2)} dx,\ a > 0, b > 0, a \neq b$.	14M	3	III
		UNIT–V			
9.	a)	Illustrate the image of the infinite strip $0 < y < \frac{1}{2}$ under the transformation $w = \frac{1}{z}$.	7M	2	II
	b)	Find the bilinear transformation that maps the point $(0,1,\infty)$ in the z-plane onto the point $(-1,-2,-i)$ in the w-plane.	7M	2	I
		OR			
10.	a)	Illustrate the image of the rectangle $R: -\pi < x < \pi, \frac{1}{2} < y < 1$ under the transformation $w = \sin z$.	7M	2	II
	b)	Find the bilinear transformation that maps $z_1 = 0, z_2 = 1, z_3 = \infty$ onto $w_1 = -1, w_2 = -i, w_3 = 1$ respectively.	7M	2	I

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Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Supplementary Examinations March 2021

Field Theory and Transmission Lines

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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Marks

UNIT–I

1. a) Charges of 20nC and -20nC are located at (3,0,0) and (-3,0,0) respectively. Calculate the magnitude of Electric field intensity at origin. 7M

   b) Given the electric flux density, $D=0.3r^2a^r$ nC/m^2 in free space. Find Electric field intensity E at point P($r=2,\theta=25^o,\phi=90^o$) 7M

OR

2. a) i. Apply Gauss law to calculate Electric field due to point charge Q.
   ii. Assume zero potential at infinity, Determine the potential at a distance 'r' from the point charge Q. 8M

   b) Two point charges -4 µC and 5 µC are located at (2,-1, 3) and (0, 4, -2), respectively. Find the potential at (1, 0, 1) assuming zero potential at infinity. 6M

UNIT–II

3. a) Consider a conductor of uniform cross section S and length l connected to a source of electromotive force. Assume electric field E exists inside the conductor to sustain flow of current. Determine the resistance of conductor. 6M

   b) Define boundary conditions? Determine the boundary conditions at dielectric-dielectric interface. 8M

OR

4. a) Define capacitance of a capacitor. Determine the capacitance of parallel plate capacitor. 7M

   b) State Continuity of current equation. Derive Continuity equation. Express the Continuity equation for steady currents and what do you infer from this expression. 7M

UNIT–III

5. a) State Biot-Savarts law. How to determine the direction of magnetic field intensity. 6M

   b) Determine Magnetic field due to straight current carrying filament of finite length. 8M

OR

6. a) State Amperes Law. Apply Amperes circuit law to determine magnetic field for Infinite sheet of current. 8M

   b) Relate Scalar and Vector magnetic potentials to Magnetic field Intensity. 6M

UNIT–IV

7. Compute the following parameters for moist soil $\epsilon_r = 16$, and $\sigma = 5mS/m$ at frequency of 100MHz.
   i. Propagation constant $\hat{\gamma}$
   ii. Attenuation constant α
   iii. Phase constant β
   iv. Intrinsic impedance $\hat{\eta}$
   v. Skin depth δ_c
   vi. Tangent loss $\tan\delta$ 14M

OR

8. a) Explain skin depth and derive expression for depth of penetration for good conductor. 7M
   b) Find skin depth for a copper conductor at frequency 1MHz. The conductivity of copper is $5.8*10^7$S/m and μ_r=1. 7M

UNIT–V

9. a) Explain the meaning of the terms characteristic impedance and propagation constant of a uniform transmission line and obtain the expressions for them in terms of parameters of line. 7M
   b) Calculate the reflection coefficient and VSWR for a 50Ω lines, terminated with
   i) matched load. ii) short circuit. 7M

OR

10. a) Derive the expression for the input impedance of a transmission line of length L 7M
    b) Explain the applications of smith chart. 7M

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Supplementary Examinations March 2021

Pulse and Digital Circuits

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Prove that for any periodic input wave form the average level of the steady state output signal from RC high pass circuit is always zero.	7M	CO1	
	b)	Derive the expression for percentage tilt(P) of a square wave output of RC high pass circuit.	7M	CO1	
		OR			
2.	a)	Analyze the high pass RC circuit for the following inputs, with the help of wave forms i) Exponential input ii) Ramp input	6M	CO1	
	b)	Explain how a low pass RC network acts as attenuator and ringing circuit	8M	CO1	
		UNIT–II			
3.	a)	Explain the working of an Emitter coupled clipper with circuit diagram.	8M	CO1	
	b)	Write a short note on Diode switching times	6M	CO1	
		OR			
4.	a)	Draw the diode comparator circuit and explain the operation of it when ramp input signal is applied.	7M	CO1	
	b)	Explain how a transistor can be used as a switch	7M	CO1	
		UNIT–III			
5.	a)	Explain the operation of Fixed-Bias Bistable multivibrator with circuit diagram and waveforms.	7M	CO2	
	b)	Design collector coupled monostable multivibrator for the following specifications. VCC=10V, VBB= -5V, IC(sat)= 10mA, hFE=20 ,VBE(off)= -0.5V, Output pulse width tp= 200µS. (assume Si transistors)	7M	CO2	
		OR			
6.	a)	Explain how an Schmitt trigger circuit acts as a comparator	7M	CO2	
	b)	Design the Astable Multivibrator to generate 1 KHz square wave. The supply voltage VCC=10V, IC(sat)=10mA hfe=50 and assume Si transistors.	7M	CO2	
		UNIT–IV			
7.	a)	Explain briefly the different methods of generating time-base waveform	6M	CO3	
	b)	With the circuit diagram explain current time base generator.	8M	CO3	
		OR			
8.	a)	Explain about the linearly correction through adjusting of driving waveform.	7M	CO3	
	b)	Explain how UJT is used for sweep circuit?	7M	CO3	
		UNIT–V			
9.	a)	Explain the basic operation of sampling gate.	8M	CO4	
	b)	Explain the operation of unidirectional diode gate.	6M	CO4	
		OR			
10.	a)	Draw and explain the circuit diagram of integrated positive DTL NAND gate.	7M	CO4	
	b)	Compare the RTL and DTL logic families in terms of Fan out, propagation delay, power dissipated per gate and noise immunity.	7M	CO4	

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Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Supplementary Examinations March 2021

Random Variables and Random Processes

(Electronics and Communication Engineering)

Max. Marks: 70 Time: 3 Hours

Answer *all five* units by choosing one question from each unit (5 x 14 = 70 Marks)

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			Marks	CO	Blooms Level
		UNIT–I			
1.	a)	Explain the concept of Total probability and Baye's Theorem	8M	CO1	L2
	b)	An experiment is throwing a coin trice, the random variable represents the number of heads comes out. Find and sketch the distribution and density functions.	6M	CO1	L1
		OR			
2.	a)	A lot of 100 semiconductor chips contains 20 that are defective. Two chips are selected at random, without replacement, from the lot. i. What is the probability that the second one selected is defective given that the first one was defective. ii. What is the probability that both are defective?	8M	CO1	L1
	b)	Explain the Gaussian random variable.	6M	CO1	L2
		UNIT–II			
3.	a)	Show that $\pm_X{}^2 = \frac{(b-a)^2}{12}$, where X is a random variable uniformly distributed over (a,b).	8M	CO2	L2
	b)	State and Prove the Chebyshev's inequality.	6M	CO2	L5
		OR			
4.	a)	What is the expected value of an exponential random variable X?	8M	CO2	L1
	b)	Determine the mean and variance of new random variable Y=2X+3, where X is Gaussian random variable.	6M	CO2	L5
		UNIT–III			
5.	a)	Define the joint density function and list out its properties.	8M	CO2	L1
	b)	State and prove Central Limit Theorem.	6M	CO2	L5
		OR			
6.	a)	Random variables X and Y have respective density functions $f_X(x) = \frac{1}{a}[u(x) - u(x-a)]$ & $f_Y(y) = bu(y)e^{-by}$ where $a > 0, b > 0$. Solve and sketch the density function of $W = X + Y$ if X and Y are statistically independent.	8M	CO2	L3
	b)	Explain about the jointly Gaussian random variables.	6M	CO2	L2
		UNIT–IV			
7.	a)	Explain the concept of Random process.	8M	CO3	L2
	b)	Explain about stationary random process.	6M	CO3	L2
		OR			
8.	a)	Explain Time Averages and Ergodocity.	8M	CO3	L2
	b)	State and prove the properties of Auto correlation function.	6M	CO3	L5
		UNIT–V			
9.	a)	Develop the relationship between the Auto correlation function and Power spectral density.	8M	CO4	L3
	b)	Determine the cross correlation function corresponding to the cross power spectrum $S_{XY}(\omega) = \frac{8}{(\alpha+j\omega)^3}$	6M	CO4	L5
		OR			
10.	a)	Develop that $S_{yy}(\omega) = S_{xx}(\omega)\lvert H(\omega)\rvert^2$.	8M	CO4	L3
	b)	Determine the transfer function $H(\omega)$ of two port RC Network	6M	CO4	L5

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