Hall Ticket Number :										

R-15

Code: 5GC41

II B.Tech. II Semester Supplementary Examinations May 2019

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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UNIT–I

1. a) Evaluate $\int_0^\infty e^{-ax}x^{m-1}\sin bx\,dx$ in terms of Gamma function 7M

   b) If $\tan(\bar{} + i¤) = e^{i\sim}$, then show that (i) $\bar{} = \left(n+\frac{1}{2}\right)\frac{®}{2}$

   (ii) $¤ = \frac{1}{2}\log\tan\left(\frac{®}{4}+\frac{\sim}{2}\right)$ 7M

OR

2. a) Prove that $\int_0^1 \frac{x^2dx}{\sqrt{1-x^4}}\,X\int_0^1\frac{dx}{\sqrt{1+x^4}} = \frac{®}{4\sqrt{2}}$. 7M

   b) Separate the real and imaginary parts of

   (i) $\sin(x+iy)$ (ii) $\cos(x+iy)$ (iii) $\tan(x+iy)$ 7M

UNIT–II

3. Derive Cauchy Riemann equations in cartesian coordinates 14M

OR

4. a) Find the analytic function whose real part is $\frac{\sin 2x}{\cosh 2y-\cos 2x}$. 7M

   b) If $f(z)$ is a regular function of z, prove that $\nabla^2|f(z)|^2 = 4|f'(z)|^2$. 7M

UNIT–III

5. a) Evaluate $\int_C \frac{e^z}{\left(z^2+®^2\right)^2}dz$, where C is $|z|=4$. 7M

   b) Find the Laurent's series expansion of $f(z)=\frac{7z-2}{(z+1)z(z-2)}$ in the region $1<|z+1|<3$. 7M

OR

6. a) If $f(z)$ is analytic in the ring-shaped region R bounded by two concentric circles C and C_1 of radii r and $r_1\,(r>r_1)$ and with the centre at a, then for all z in R, prove that

   $$f(z)=a_0+a_1(z-a)+a_2(z-a)^2+-----+a_{-1}(z-a)^{-1}+a_{-2}(z-a)^{-2}+----$$

   where $a_n=\frac{1}{2®i}\int\frac{f(t)}{(t-a)^{n+1}}dt$ 7M

   b) Expand $\sin z$ in a Taylor's series about $z=0$ and determine the region of convergence. 7M

UNIT–IV

7. a) By integrating around a unit circle, evaluate $\int_0^{2\pi} \frac{\cos 3\theta}{5-4\cos\theta} d\theta$ 7M

   b) Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2 (z-2)} dz$, where C is the circle $|z| = 3$ 7M

OR

8. Evaluate $\int_{-\infty}^{\infty} \frac{e^{ax}}{e^x + 1} dx$ 14M

UNIT–V

9. a) Show that $w = \frac{i-z}{i+z}$ maps the real axis of z-plane into the circle $|w| = 1$ and the half plane $y > 0$ into the interior of the unit circle $|w| = 1$ in the w-plane. 7M

   b) Find the bilinear transformation which maps 1, i, -1 to 2, i, -2 respectively. Find the fixed and critical points of the transformation. 7M

OR

10. a) Discuss the transformation $w = e^z$. 7M

    b) Prove that the transformation $w = \sin z$, maps the families of lines x = constant and y = constant into two families of confocal central conics. 7M

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Hall Ticket Number :										

R-15

Code: 5G246

II B.Tech. II Semester Supplementary Examinations May 2019

Electrical Technology

(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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UNIT–I

1. Explain about Impedance and Admittance Parameters in detail with example and draw equivalent circuits.

OR

2. a) Explain in detail about the ABCD parameters with example.

   b) Obtain the expression of Z parameters in terms of Y parameters.

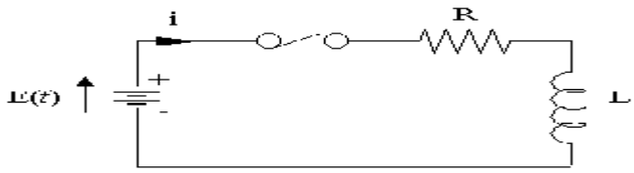
UNIT–II

3. a) Explain in detail about the transients in R-C series circuit with DC Excitation?

   b) A circuit of resistance 10 ohms and the inductance of 0.1 H in series has a direct voltage of 200 V suddenly applied to it. Find the voltage drop across inductance at the instant of switching on and at 0.01 second?

OR

4. A series RL circuit with R=30 Ω and L= 15H has a constant voltage V=60 V applied at t=0 as below .Determine the current I the voltage across the inductor.



UNIT–III

5. a) Define filter and write short notes on low-pass filter?

   b) Discuss about constant k low pass and high pass filters.

OR

6. a) Relate the characteristics of pass band and stop band filters, explain them.

   b) A filter is required to pass all frequencies above 25 kHz and to have a nominal impedance of 600 Ω. Design (i) a high-pass T section filter and (ii) a high-pass π- section filter to meet these requirements?

UNIT–IV

7. a) Explain how the speed of a DC shunt motor is controlled through flux and armature control method?

   b) Derive the EMF Equation of a DC Generator?

OR

8. a) A separately excited generator supplies 80A at 240 V when running at 1200 rpm suddenly the speed drops to 1000 rpm and there is a 5% decrease in field flux. Find the load current under new conditions. Assume Ra=0.1 Ω. What would be the terminal voltage.

   b) How many parallel current paths will be there in the armature of an 8 pole machine if the armature is simplex lap wound, Duplex wave wound, triplex lap wound.

UNIT–V

9. Explain how the efficiency of a transformer may be estimated from open circuit and short circuit tests.

OR

10. a) Explain the shaded pole motor with neat sketch.

    b) Justify the statement " single phase motor is not self starting".

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Supplementary Examinations May 2019

Pulse and Digital Circuits

(Electronics & 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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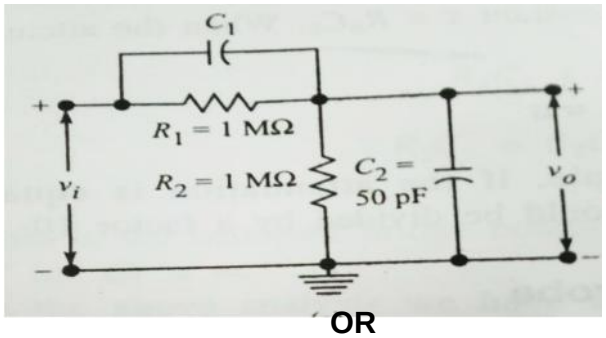
UNIT–I

1. a) Explain attenuator under perfect compensation, over compensation and under compensation with suitable diagrams. 6M

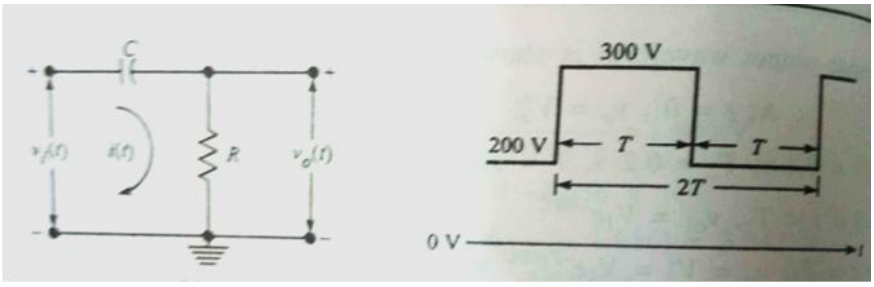
   b) Compute and draw to scale the output waveform for a) C_1 = 50 pF b) C_1 = 75pF, and c) C_1 = 25 pF respectively for the circuit shown for a input of 20V step.



8M

OR

2. a) The square wave shown in figure is fed to an RC coupling network. What are the output voltage wave forms if a) RC =10T b) RC = T/10



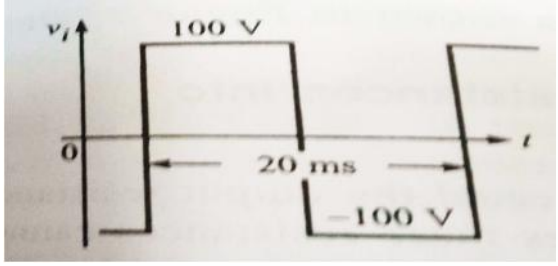
8M

   b) A 1kHz symmetrical square wave of ± 10V is applied to an RC circuit having 1ms time constant. Calculate and plot the output for the RC configurations as a) high-pass circuit and b) Low-pass circuit 6M

UNIT–II

3. a) Explain the clamping circuit considering the source resistance and the diode forward resistance. 6M

   b) A 100V peak square wave with a period of 20ms shown in figure. Is to be negatively clamped at 25V. Draw the circuit diagram necessary for this purpose. Draw the output waveform.

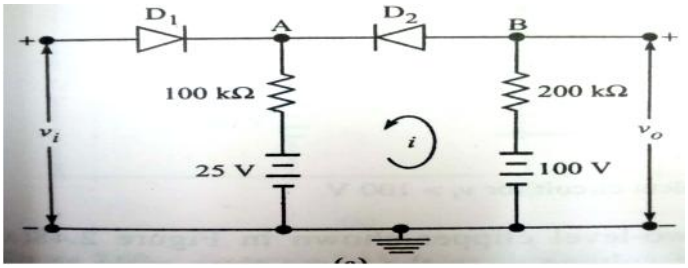


8M

OR

4. a) Explain series and shunt clippers with and without reference voltage and also explain clipping at two independent levels with help of transfer characteristics. 6M

   b) The input voltage Vi to the two-level clipper shown varies linearly from 0 to 150V. Sketch the output voltage Vo to the same time scale as the input voltage. Assume ideal diodes.



8M

UNIT–III

5. a) With neat circuit diagram, Explain the working of fixed bias bistable multi vibrator. 6M

   b) Design and draw a collector-coupled ONE-SHOT using silicon npn transistors with h_{FE}(min) =20. In stable state, the transistor in cut-off has V_{BE} = -1V and the transistor in saturation has base current, I_B which is 50% excess of the I_B(min) value. Assume V_{CC} = 8V, I_C(sat) =2mA, delay time = 2.5ms & $R_1 = R_2$. Find R_C, R, R_1, C and V_{BB} . 8M

OR

6. a) Design a collector-coupled Monostable multivibrator using an n-p-n silicon transistor with h_{FE}(min) = 40, V_{BE} (cut off) ≈ 0 V and I_B(sat) = 1.5 I_B (min). Given that: V_{CC} = 10 V, I_C (sat) = 5 mA, $R_{C1} = R_{C2} = R_C$, V_{CE} (sat) = 0.2 V and V_{BE}(sat) = 0.7 V. If the pulse width required is 1 ms, calculate the value of C. 8M

   b) Design a Schmitt trigger circuit using npn silicon transistors with V_{BE} = 0.7V, V_{CE} (sat) = 0.2V, h_{fe}(min) = 60 and I_C(ON) = 3mA to meet the following specifications: V_{CC} =12V, upper threshold voltage, V_{UT} = 4V, lower threshold voltage, V_{LT} =2V. 6M

UNIT–IV

7. a) List out the various methods to generate a time base waveform 6M

   b) The specifications of UJT are given as η =0.6, V_v = 2 V, R_{BB} = 5 kΩ, I_v = 1.5 mA, I_P = 8 μA and V_{BB} = 18 V. Calculate the component values of the UJT sweep circuit to generate an output sweep frequency of 10 kHz with sweep amplitude of 12 V. 8M

OR

8. a) Explain the basic principles of Miller and Bootstrap time base generators. 6M

   b) Discuss about Transistor Current Time Base Generator 8M

UNIT–V

9. a) Explain how the loading of the control signal is reduced when the number of Inputs increases in a sampling gate. 8M

   b) Explain, how Monostable multivibrator can be used for frequency division? 6M

OR

10. a) Explain the function of a sampling gate used in Sampling Scopes also explain how sampling gate is used in chopping amplifiers. 8M

    b) How to cancel the pedestal in a sampling gate? Discuss with suitable circuit diagram. 6M

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Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Supplementary Examinations May 2019

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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UNIT–I

1. a) State and prove divergence theorem 7M

   b) A square plate described by $-2 \leq x \leq 2, -2 \leq y \leq 2, z = 0$ carries a charge 12 mC/m^2. Find the total charge on the plate and the electric field intensity at $(0, 0, 10)$. 7M

OR

2. a) Determine the electric flux density due to uniformly charged sphere by using Gauss's law and draw the variation of **D** with radius. 7M

   b) A point charge of 5 nC is located at the origin. If $V = 0$ at $(0, 6, -8)$, find

      (i) The potential at $A(-3, 2, 6)$

      (ii) The potential at $B(1, 5, 7)$

      (iii) The potential difference V_{AB} 7M

UNIT–II

3. a) Define the following terms

      (i) Isotropic dielectric

      (ii) Homogeneous dielectric

      (iii) Dielectric constant 6M

   b) Derive the capacitance of coaxial cable having the inner conductor radius 'a' and outer conductor radius 'b'. 8M

OR

4. a) Discuss about convection current and conduction current 6M

   b) Derive the capacitance of parallel plate capacitor and then prove that the energy stored in parallel plate capacitor is $\frac{1}{2}CV^2$ 8M

UNIT–III

5. a) Find out the magnetic field intensity due to infinite sheet charge using Ampere's Circuit law. 8M

   b) Planes $z = 0$ and $z = 4$ carry current $K = -10a^x A/m$ and $K = 10a^x A/m$, respectively. Determine **H** at

      (i) (1, 1, 1)

      (ii) (0, -3, 10) 6M

OR

6. a) Derive magnetic scalar and vector potentials 8M

   b) State and explain Faraday's law 6M

UNIT–IV

7. a) State and prove Poynting theorem 6M

   b) In a nonmagnetic medi[illegible]g the[illegible]

   $$E = 4 \sin(2_{\pi \times} 10^{7} t - 0.8_{x)a^{z}} \text{ V/m}$$

   Find

   (i) ε_r, η

   (ii) The time average power carried by the wave

   (iii) The total power crossing 100 cm^2 of plane 2x + y = 5. 8M

OR

8. a) Derive the reflection coefficient and transmission coefficient when the EM wave incident on perfect dielectric with normal incidence. 7M

   b) In free space ([illegible]), a [illegible]e wave with [illegible]

   $$H_i = 10 \cos(10^{8} t - \beta z)a_x \; mA/m$$

   Is incident normally on a lossless medium $(\varepsilon = 2\varepsilon_0, \mu = 8\mu_0)$ in region $z \geq 0$. Determine the reflected wave **H_r, E_r** and the transmitted wave **H_t, E_t**. 7M

UNIT–V

9. a) Define and derive the relation between reflection coefficient and standing wave ratio of a transmission line. 6M

   b) A lossless transmission line with [illegible] 50 [illegible] n l [illegible] an[illegible] erates at 2 MHz. The line is terminated with a load $Z_L = 60 + j40\,\Omega$. If [illegible] is 30 [illegible] ong [illegible] $u = 0.6_{c}$ [illegible] d op[illegible] on the line, find

   (i) The reflection coefficient

   (ii) The standing wave ratio

   (iii) The input impedance 8M

OR

10. a) Discuss about smith chart and its applications 7M

    b) Differentiate between lossless transmission line and distortion less transmission line and obtain the condition for distortion less line. 7M

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Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Supplementary Examinations May 2019

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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UNIT–I

1. a) Write note on uniform and exponential random variable. 6M

   b) Consider a random variable X that takes discrete values, X={0,1,2,....n } for an event, {X ≤ x}. Compute the PDF for a binomial random variable with parameters(n, p) where n=4 and p=0.6 and find the following:

      i. P[1.5<X< 3]

      ii. P(0≤ X≤ 3)

      iii. P(1.2< X≤ 1.8) 8M

OR

2. a) What are conditional density functions? List properties of conditional density function. 7M

   b) Find the mean of an exponential distribution. 7M

UNIT–II

3. a) Discuss concepts of moment generation function and characteristic function of random variable. 8M

   b) Explain the concept of expectation of random variables. 6M

OR

4. a) Determine the mean value of following exponential function:

$$f_x(x) = \begin{cases} \dfrac{e^{-(x-a)/b}}{b} & x > a \\ 0 & x < a \end{cases}$$

   Then from that result calculate variance and skew of the same. 7M

   b) Write note on moments of random variable. Derive expression for variance and skew. Write note on Chebyshev's inequality. 7M

UNIT–III

5. a) Discuss on joint distribution function and its respective properties. 7M

   b) State joint density function and discuss the properties of joint density function 7M

OR

6. a) Compute the joint characteristic function of X and Y if

$$f_{xy} = \frac{1}{2\pi} \exp\left(\frac{-1}{2}(x^2 + y^2)\right)$$ 7M

   b) Show that the characteristic function and probability density function of a random variable forms a Fourier transform pair. State the central limit theorem 7M

UNIT–IV

7. a) Define ergodicity and explain time average, mean ergodic and Correlation ergodic random process. 7M

   b) List all the properties of auto-correlation and cross-correlation functions. 7M

OR

8. a) State some useful classifications of Random Processes. 7M

   b) Describe first order stationary random process and wide sense stationary random processes. 7M

UNIT–V

9. a) Derive expression for power density spectrum of a random variable. 7M

   b) A cross power density function is given below

$$\delta_{xy}(\omega) = \begin{cases} a + jb\dfrac{\omega}{W} & ; -W < \omega < W \\ 0 & ; \text{Elsewhere} \end{cases}$$

   Find cross correlation function. 7M

OR

10. a) Derive relationship between cross power density spectrum and cross correlation function. 7M

    b) Find the power of the following random process, $x(t)=A_0\cos(\omega_0 t+\theta)$, where A0 , ω0 are constant and θ is uniformly distributed (0,π/2) . Also check, the stationarity of the process. 7M

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Hall Ticket Number :										

R-15

Code: 5G343

II B.Tech. II Semester Supplementary Examinations May 2019

Analog Communication

(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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UNIT–I

1. a) The carrier swing of a frequency-modulated signal is 70 KHz and the modulating signal is a 7 KHz sine wave. Determine the modulation index of the FM signal. 4M

   b) With the help of circuit diagram explain the operation of envelop detector for AM. 10M

OR

2. a) Sketch the circuit diagram of balanced modulator and explain how DSB-SC waveform is generated using any two methods. 7M

   b) Explain with sketch the phase discrimination method of SSB generation. 7M

UNIT–II

3. a) Explain the generation of Narrow band Frequency Modulation with suitable block diagram. 6M

   b) A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is: (i) 1 kHz (ii) 15 kHz. 8M

OR

4. a) Derive Carson's rule for the Bandwidth of an FM signal. 4M

   b) The equation for a FM wave is $s(t) = 10\sin [5.7 \times 10^8 t + 5 \sin 12 \times 10^3 t]$.
   Calculate: (i) Carrier frequency. (ii) Modulating frequency. (iii) Modulation index. (vi) Frequency deviation. (v) Power dissipated in 100 Ω. 10M

UNIT–III

5. a) Compare the noise performance of DSB-SC and SSB-SC. 7M

   b) Write note on Threshold effect in Angle Modulation System. 7M

OR

6. a) Write short note on Pre-Emphasis and De-Emphasis circuits. 7M

   b) Explain the noise performance of FM systems. 7M

UNIT–IV

7. a) Classify the radio transmitters based on type of modulation and service involved. 7M

   b) Draw the block schematics of super heterodyne receiver and explain the operation of each block. 7M

OR

8. a) Discuss AGC and its principle of working in communication system. 7M

   b) Explain working of Variable reactance type FM Transmitter. 7M

UNIT–V

9. a) Discuss the necessity of multiplexing and Write short notes on FDM. 7M

   b) Compare PAM, PWM and PPM? 7M

OR

10. a) Explain the method of generation and detection of PAM signals with neat schematics. 7M

    b) Explain, how PPM signal is demodulated? What are its merits and demerits? 7M

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