Hall Ticket Number :										

R-15

Code: 5GC41

II B.Tech. II Semester Supplementary Examinations December 2017

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) Express the integrals $\int_0^\infty x e^{-x^8} dx \,.\int_0^\infty x^2 e^{-x^4} dx$ in terms of Gamma functions. 8M

   b) Find the principal value of $\sqrt{2i}$. 6M

OR

2. a) Show that $\int_0^{\frac{\pi}{2}} \frac{d\theta}{\sqrt{\sin\theta}} . \int_0^{\frac{\pi}{2}} \sqrt{\sin\theta}\, d\theta = \pi$ 7M

   b) Find the real and imaginary parts of $\cot z$ 7M

UNIT–II

3. a) State and prove Cauchy-Riemann equations in polar form and hence deduce that $\frac{\partial^2 u}{\partial r^2} + \frac{1}{r}\frac{\partial u}{\partial r} + \frac{1}{r^2}\frac{\partial^2 u}{\partial \theta^2} = 0$ 7M

   b) Find an analytic function, whose real part is $\frac{\sin 2x}{(\cosh 2y - \cos 2x)}$ 7M

OR

4. Show that for $f(z) = \frac{2xy(x+iy)}{x^2+y^2}$ *if* $z \neq 0$ $= 0$ *if* $z = 0$ the C-R equations are satisfied at origin but derivatives of $f(z)$ at origin does not exist. 14M

UNIT–III

5. a) Evaluate, using Cauchy's integral formula $\int_c \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)} dz$ where c is the circle $|z| = 3$ 7M

   b) Find the Taylor's expansion of $f(z) = \frac{1}{(z+1)^2}$ about the point $z = -i$ 7M

OR

6. a) Evaluate $\int_c z^2\, dz$ along the straight line from $z = 0$ to $z = 2 + i$ 7M

   b) Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent series valid for $0 < |z+1| < 2$. 7M

UNIT–IV

7. a) Find the sum of the residues of $f(z)=\dfrac{\sin z}{z\cos z}$ at its poles inside the circle $|z|=2$ 7M

   b) Use Rouche's theorem to solve $p(z)=z^9-2z^6+z^2-8z-2,\ C:|z|=1$ 7M

OR

8. a) Using Residue theorem, evaluate $\int_c \dfrac{3z^2+2}{(z-1)(z^2+9)}dz$, where C is the circle $|z-2|=2$. 7M

   b) State and prove Argument principle. 7M

UNIT–V

9. a) Discuss the transformation $w=\sin z$. 7M

   b) Find the bilinear transformation which maps the points $z=0,\ 1,\ \infty$ onto $w=-1,-i,\ 1$. 7M

OR

10. a) Show that $w=\dfrac{i-z}{i+z}$ 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 the points $z=1,i,-1$ onto $w=2,\ i,-2$ respectively. Find the fixed points of the transformation. 7M

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Hall Ticket Number :										

R-15

Code: 5G246

II B.Tech. II Semester Supplementary Examinations December 2017

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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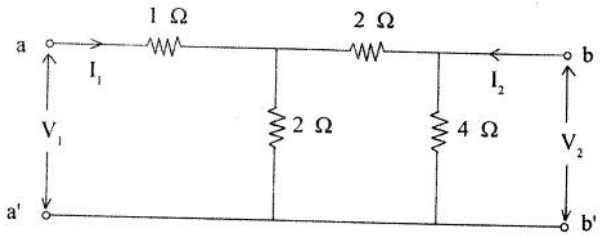
UNIT–I

1. a) Discuss relation of z parameters and ABCD parameters 7M

   b) Appraise the importance of cascaded connection of two port networks. 7M

OR

2. a) Deduce y parameters of the network shown.



7M

   b) When two 2 port networks N1 and N2 are connected in parallel, relate equivalent parameters of combined network in terms of y parameters of individual networks. 7M

UNIT–II

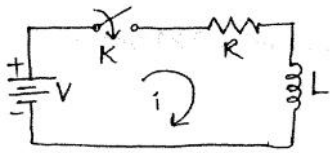
3. a) The series RLC circuit with R=10 Ω, L=10mH and C= 10μF is excited by 100 V. Evaluate the transient response current i(t) after 10 ms. 7M

   b) State and derive final value theorem. 7M

OR

4. a) The input for voltage for series RC circuit is 180 V, with R= 18 Ω and C=41.3 mH. Determine expression for current. 7M

   b) In the given network ,switch k is closed at t=0 with zero current in inductor . Find the values of I, di/dt and d^2i/dt^2 at t-0+ if R=20 Ω, L= 2 H and V=200V



7M

UNIT–III

5. a) Compare low pass, band pass and high pass filters. 7M

   b) Elaborate T type and π type symmetrical attenuators. 7M

OR

6. a) Classify filters based on frequency and write briefly about each. 7M

   b) Elaborate attenuators in general. 7M

UNIT–IV

7. a) Explain the process of commutation 7M

   b) Describe with neat sketch the construction of dc machine. 7M

OR

8. a) What is the principle of DC generator and deduce the EMF equation of DC generator. 7M

   b) Illustrate and explain different characteristics of DC generator. 7M

UNIT–V

9. a) What is the principle of transformer and construct the vector diagram under no load. 7M

   b) Describe the principle of stepper motor and illustrate its characteristics 7M

OR

10. a) Justify the statement " single phase motor is not self-starting 7M

    b) Define regulation of transformer and summarize the OC and SC test of transformer. 7M

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Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Supplementary Examinations December 2017

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 Gauss law and explain applications of gauss law. 7M

b) Derive an expression for energy stored and energy density in electrostatic field. 7M

OR

2 a) Define divergence, gradient, curl in spherical co-ordinate system with mathematical expression 7M

b) State and proof divergence theorem. 7M

UNIT–II

3 a) Derive an expression for series and parallel plate capacitor. 7M

b) Derive an expression for capacitance of concentric spheres and for capacitance of co-axial cable. 7M

OR

4 a) Discuss the properties of dielectric materials. 7M

b) Derive the boundary conditions of the normal and tangential components of electric field at the interface of two media with different dielectrics. 7M

UNIT–III

5 a) Derive General field relation for time varying electric and magnetic fields using Maxwell's' equations 7M

b) Write a technical note on "Faradays law of electromagnetic induction". 7M

OR

6 a) Derive an expression for energy stored in a magnetic field. 7M

b) Derive the Maxwell's equations in integral and differential forms. Hence derive standard wave equations. 7M

UNIT–IV

7 a) Derive the expression for the attenuation constant, phase constant and intrinsic impedance for a uniform plane wave in a good conductor. 7M

b) Define and explain Polarization. Explain the types and significance of polarization in EM wave propagation with supporting equations. 7M

OR

8 a) Derive suitable relations for integral and point forms of Poynting theorem. 7M

b) A plane wave propagating through a medium with $\varepsilon_r = 8$, $\mu_r = 2$ has $E = 0.5 \sin (108\ t - z)\ a_z$ V/m. Determine (i) The loss tangent (ii) Wave impedance (iii) Wave velocity (iv) H field 7M

UNIT–V

9 a) Derive the Telegraphic equations of transmission lines. 6M

b) Explain the characteristics of distortion less transmission line and telephone cable. 8M

OR

10. a) Explain the principles of impedance matching using Single stub tuner and double stub tuner with diagrams. Differentiate SST from DST. 7M

b) Derive the input impedance of a lossless line. For a shorted section of 75 ohm transmission line, $l = \lambda/4$, find the input impedance assuming $\alpha = 0$. 7M

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Supplementary Examinations December 2017

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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UNIT–I

1. a) A 10HZ symmetrical square wave whose peak-to-peak amplitude is 2V is impressed upon a high pass RC circuit whose lower 3 dB frequency is 5HZ. Calculate and sketch the output waveform. In particular, what is peak-to-peak output amplitude? 7M

   b) Explain how Low Pass RC network acts as ringing circuit? 7M

OR

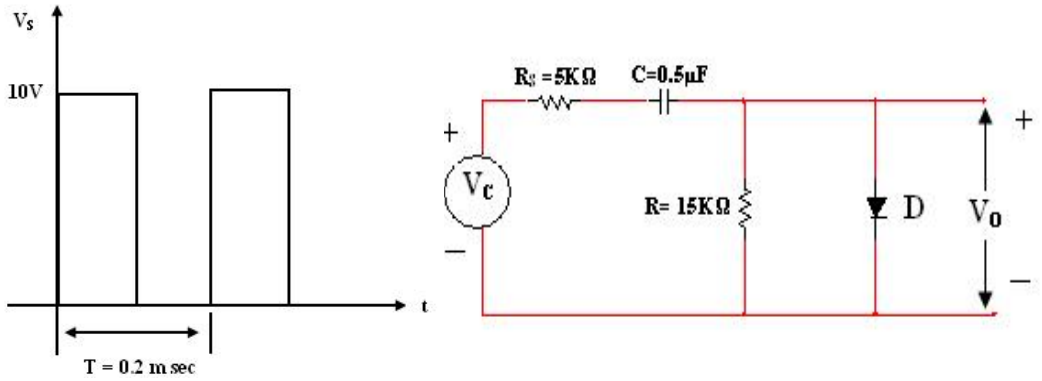
2. a) A square wave whose peak-to-peak value is 1V extends ±0.5V with respect to ground. The half period is 0.1sec, this voltage impressed upon an RC differentiating circuit whose time constant is 0.2sec. Determine the maximum and minimum values of the output voltages in the steady state. 7M

   b) What is an attenuator? Explain the under and over Compensation in attenuator 7M

UNIT–II

3. a) Define comparator and explain some applications of voltage comparators? 7M

   b) For the network shown below, draw the output wave for the first three cycles, labeling all voltage levels and time constants. For 'D' R_f=100Ω,R_0=∞,Vγ=0V .



7M

OR

4. a) Explain the two level transistor clipper circuit Derive the equation for input voltage swing. 7M

   b) Write a short note on diode switching times. 7M

UNIT–III

5. a) Design an Astable multivibrator for an output amplitude of 15V and square wave frequency of 500HZ. Assume $h_{fe\ min}$=50, Ic(sat)=5mA and V_{CE}(sat)=0V. 7M

   b) Explain about unsymmetrical triggering of Bi-stable multivibrator 7M

OR

6. a) Explain how an schmitt trigger can be used as a squaring circuit 7M

   b) What do you understand by hysteresis? What is Hysteresis voltage? Explain how hysteresis can be eliminated in a schmitt trigger 7M

UNIT–IV

7. a) Explain about the transistor boot strap time-base generation. 7M

   b) Explain about the transistor Miller time- base generator. 7M

OR

8. a) Classify the different methods of generating a time base waveform? Explain them briefly. 7M

   b) Explain the simple current sweep circuit. 7M

UNIT–V

9. a) Draw the circuit diagram of the uni directional diode gate with more than two inputs and explain its operation. 5M

   b) How do you overcome the loading effect of signal sources on control voltage? 4M

   c) Draw the circuit diagram of a Sampling Gates with more than one control voltage and explain its working. 5M

OR

10. a) Explain the positive logic AND gate and Negative logic AND gate circuit using Diode logic. 7M

    b) Classify and compare various logic families in detail. 7M

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Hall Ticket Number :										

R-15

Code: 5G341

II B.Tech. II Semester Supplementary Examinations December 2017

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) Define conditional probability and obtain P(A/B) if
   (i) A<=B (ii) B<=A.
   b) Prove that two events A and B cannot be both mutually exclusive and statistically independent at the same time.
   c) If two dice are rolled simultaneously what is the probability for the sum on the faces showing up is <=10.

OR

2. a) Define cumulative distribution function &state its properties.
   b) Two cards are drawn from a 52 card deck and the first is not replaced , find the probability for
      i. Given that the first card is queen, the second is also a queen.
      ii. Given that the first card is queen, the second is a 7.

UNIT–II

3. a) The probability density function of a random variable is given by ,
   $f_{x,}(x)= 35\exp(-7x),x>0$
   find (i) E[X] (ii) $E[4X^2+3X]$ (iii) var(x)
   b) The probability density function of a random variable is given by ,
   $f_{x,}(x)= \{kx, \quad 0<x<1$
   find (i) k (ii) $F_X^{(X)}$

OR

4. a) State chebyshev's inequality and explain its significance.
   b) Is the gaussian density function with power density function a valid power density function?
   $f_{x,}(x) = [\ 1/\{\sigma.\ (2\pi)\ 1/2\}].\ \exp[\ -\ \{(x - m)2\ \}/\ (2\sigma\ 2\ )\ ]$
   Find the mean and variance of the above gaussian power density function.

UNIT–III

5. a) Find the value of 'b' such that the given power density function(joint) is a valid power density function, $f_{x,y}(x,y)=bxy^2\exp(-2xy)u(x-2)\ u(y-1)$
   b) Two statistically independent random variables X and Y have respective power density function $f_{x,}(x) = 5\ u(x\ )\exp(-5x)\ f_y(y) =2\ u(y\ )\exp(-5y)$
   Find the power density function of the sum W=X+Y

OR

6. a) State the central limit theorem
   b) The joint power density function of two random variables X and Y is ,
   $f_{x,y}(x,y)=5x^2y/16,0<y<x<2$
   are X and Y statistically independent.
   c) Define the joint characteristic function and state its properties.

UNIT–IV

7. a) Define
   (i) Ergodic Random process.
   (ii) Mean Ergodic Random process.

   b) Define cross covariance function for two random process X(t) and Y(t) and when are two random process said to be uncorrelated.

   c) Statistically independent zero mean random process X(t) and Y(t) have auto correlation function $R_{XX}.^{(S)}=e^{-|s|}$, $R_{yy}^{(S)}= \cos(2\pi s)$
   Find auto correlation function of W(t)= X(t)+ Y(t).

OR

8. a) The random process $X(t)=A^2\cos^2(W_Ct+\Omega)$ where and are constants and Ω is a random variable uniformly distributed in the interval (0 2π). is X(t) wide sense stationary .

   b) Consider a random process $X(t)=Y\cos(W_Ct)$,t>0) where W is a constant and Y is a random variable uniformly distributed in the interval (0 1). Find the mean and autocorrelation of x(t).

   c) Define poisson process.

UNIT–V

9. a) The autocorrelation of a random process X(t) which is WSS is given by $R_{XX}.^{(t)}$ ={1-|*t* | , | *t*|≤1,} find the power spectral density.

   b) Define cross power spectral density &state its properties.

OR

10. a) The power spectral density a random process X(t) $S_{xx}^{(w)}=1-\frac{w}{4\pi}$, |W|≤1,
   Find the average power in the process.

   b) Derive the relationship between cross power spectral density & cross correlation function.

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Hall Ticket Number :										

R-15

Code: 5G343

II B.Tech. II Semester Supplementary Examinations December 2017

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 antenna current of an AM broadcast transmitter modulated to a depth of 40% by an audio sine wave is 11 A. It increases to 12 A as a result of instantaneous modulation by another audio sine wave. What is the modulation index of the second wave? 5M

   b) With a neat circuit diagram, explain the principle of envelope detection of an amplitude modulated wave. 7M

   c) In an amplitude modulated signal if the total power is 600 W and the power in carrier is 400 W, what is the modulation index? 2M

OR

2. a) An AM signal is defined by x(t)=5cos 1000πt + 20cos 2000πt + 5cos 2200πt. Determine modulating signal m(t), the carrier and the modulation index. 4M

   b) A sinusoidal carrier $c(t) = 100\cos(2® 10^5 t)$ is amplitude modulated by a sinusoidal voltage $m(t) = 50\cos(2® 10^3 t)$ up to a modulation depth of 50%.

      i. Write down the expression for the modulated waveform.
      ii. Calculate amplitude and frequency of each sideband.
      iii. Find out the carrier power, sideband power and total power.
      iv. Draw the spectrum of the modulated waveform. 8M

   c) Does the signal $x(t) = \text{sinc}(f_0 t)$ is band limited or time limited? Explain. 2M

UNIT–II

3. a) Explain the relationship between FM and PM. 4M

   b) How many sidebands (theoretically) are there in an FM signal? Practically how many sidebands are considered and why? What is the corresponding bandwidth requirement? If the modulating frequency is increased from 10 kHz to 20 kHz, what happens to the bandwidth? (Assume initial bandwidth of B Hz). 8M

   c) What is the modulation index of FM signal having a carrier swing of 100 KHz and the modulation signal has frequency of 8 KHz? 2M

OR

4. a) Explain with necessary block diagram the demodulation of FM signal. 7M

   b) Explain Armstrong method of FM generation. 7M

UNIT–III

5. a) What is white noise? Draw the power spectral density of white noise. 4M

   b) If the maximum frequency deviation of an FM signal is doubled without changing the frequency of the sinusoidal modulating frequency, what happens to the output SNR? 4M

   c) Derive an expression for output SNR for DSB-SC system. 6M

OR

6. a) What is the role of pre-emphasis and de-emphasis filter in FM broadcasting. 8M

   b) Write short note on threshold in frequency modulation. 6M

UNIT–IV

7. a) What is a tuned radio frequency TRF receiver 7M

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

OR

8. a) What do you mean by heterodyne? 2M

   b) Write short notes on
      i. AGC
      ii. frequency stability in FM Transmitter
      iii. Frequency changing and tracking 12M

UNIT–V

9. a) Explain how multiple channels are multiplexed using TDM. How does it is different from FDM. 8M

   b) Write short notes on Single polarity PAM and double polarity PAM 6M

OR

10. a) Two signals band limited to 3 and 5 kHz are to be time division multiplexed. Find the maximum permissible interval between two successive samples. 4M

    b) Describe with methods of generation of PWM and PPM signal. 10M

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