Hall Ticket Number :										

Code: 5G341

R-15

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

Random Variables and Random Processes

(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) A ball is selected from an urn containing two black balls, numbered 1 and 2, and two white balls, numbered 3 and 4. Let the events A, B and C be defined as follows A={black ball},B={even numbered ball} and C={ball number<2}. Test A and B, A and C are independent or not. 7M

   b) A random variable X has the density function $f_X(x) = \frac{1}{2}u(x)\exp\left(-\frac{x}{2}\right)$ Define events $A = \{1 < X \leq 3\}$, $B = \{X \leq 2.5\}$, and $C = A \cap B$.
   Find the probabilities of events i) A, ii) B, and iii) C. 7M

OR

2. a) An experiment consists of observing the sum of the numbers showing up when two dice are thrown. Develop a model for this experiment. Also find P(A) and P(A∩B). 8M

   b) Define distribution function. List out various properties of CDF. 6M

UNIT–II

3. a) A random variable X is uniformly distributed on the interval (-5,15). Another random variable $Y = e^{-X/5}$ is formed. Find $E[Y]$. 7M

   b) State and Prove the Chebychev's Inequality. 7M

OR

4. a) Write about moments about the origin and about the central moments. 7M

   b) Show that the mean value $E(X)$ and variance σ_X^2 of the Rayleigh random variable are $E[X] = a + \sqrt{\pi b}/4$ and $\sigma_X^2 = b(4-\pi)/4$. 7M

UNIT–III

5. a) Define Joint density function. List out its various properties. 7M

   b) The joint density function of two random variables X and Y is $f_{X,Y}(x,y) = \frac{1}{12}u(x)u(y)e^{-\left(\frac{x}{4}\right)-\left(\frac{y}{3}\right)}$. Test X and Y are statistically independent or not. 7M

OR

6. a) Obtain the expressions for conditional distribution and density i) Point conditioning ii) Interval conditioning 6M

   b) Consider two independent uniform distributed random variables X_1 and X_2 having the same density $f_X(x) = \frac{1}{a}[u(x) - u(x-a)]$. Find the density function of $W = X_1 + X_2$ using Central Limit Theorem. 8M

UNIT–IV

7. a) Discuss the random process concept in detail. 7M

   b) Assume that an ergodic random process $X(t)$ has an autocorrelation function $R_{XX}(\tau) = 18 + \frac{2}{6+\tau^2}[1 + 4\cos(12\tau)]$ i) Find $|\bar{X}|$ ii) What is the average power in (t) . 7M

OR

8. a) Define Autocorrelation function and write its properties. 6M

   b) Given the random process $X(t) = Acos(\omega_0 t) + Bsin(\omega_0 t)$ where ω_0 is a constant, and A and B are uncorrelated zero-mean random variables having different density functions but the same variance σ^2, show that $X(t)$ is a wide-sense stationary but not strictly stationary. 8M

UNIT–V

9. a) Show that the power density spectrum for the random process is $S_{XX}(\omega) = \lim_{T\to\infty} \frac{E[|X_T(\omega)|^2]}{2T}$. 8M

   b) Find cross-correlation function for the given cross power density spectrum $S_{XY}(\omega) = \frac{8}{(\alpha + j\omega)^3}$ where $\alpha > 0$ is a constant. 6M

OR

10. a) Explain relationship between autocorrelation function and power spectrum. 8M

    b) Obtain autocorrelation function and power spectrum for white noise. 6M

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Hall Ticket Number :										

R-15

Code: 5G343

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

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) Explain the method of AM wave using Square law modulator? 6M

   b) With a neat diagram explain how a SSB wave is generated using Phase Discriminator method with only USB and rejecting the LSB. 8M

OR

2. a) The output current of a 60% modulated AM generator is 1.5A. To what value will this current rise if the generated is modulated additionally by another audio wave, whose modulation index is 0.7? What will be the percentage power saving if the carrier and one of the sidebands are suppressed? 5M

   b) Explain briefly about VSB modulation and demodulation. 9M

UNIT–II

3. a) Write down the expressions for WBFM and NBFM? Explain Carson's rule of FM bandwidth? 9M

   b) An FM signal is represented in time domain as s (t) = 10 Cos (2π.106 t + 5 Sin 8π.103 t). Calculate the frequency deviation, modulation index, power and band width. 5M

OR

4. a) Derive the expression for a single tone narrow band frequency modulated (NBFM) wave with neat block diagram. 6M

   b) With a neat block diagram explain the generation of narrow band and wide band FM. 8M

UNIT–III

5. a) Draw the block diagram of FM demodulator and explain the effect of noise in detail and compare the performance of AM and FM in the presence of noise. 8M

   b) Explain the noise performance of SSB - SC receiver and prove its S/N Ratio is unity. 6M

OR

6. a) Prove that the FoM for AM is less than one. 7M

   b) Derive the expression and explain how pre-emphasis/de-emphasis filtering improves the signal to noise ratio? 7M

UNIT–IV

7. a) What is image frequency? How is it rejected? Also enumerate the steps to improve the image frequency rejection? 6M

   b) Describe the circuit of an FET amplitude limiter, and with the aid of the transfer characteristic explain the operation of the circuit. 8M

OR

8. a) Define conversion trans-conductance of a mixer. With the help of a typical circuit diagram, explain the working of a separately excited mixer. 8M

   b) Explain about radio broadcast transmitters with the help of block diagram. 6M

UNIT–V

9. a) Explain the generation and demodulation of PWM signals. 8M

   b) Explain the generation and demodulation of a PPM signal from PWM with neat circuit diagram 6M

OR

10. a) Compare TDM and FDM. 5M

    b) Explain TDM with its block diagram and discuss the need for synchronization in TDM. 9M

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Hall Ticket Number :										

Code: 5GC41

R-15

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

Complex Variables & Special Functions

(Common to EEE and 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 $\int_0^1 x^5 \left(log\frac{1}{x}\right)^3 dx$ 7M

   b) Separate $log\ sin(x+iy)$ into real and imaginary parts. 7M

OR

2. a) Prove that $\beta\left(m,\frac{1}{2}\right) = 2^{2m-1}\beta(m,m)$ 7M

   b) If $cosh(u+iv) = x+iy$ prove that$(i)\ \frac{x^2}{cosh^2u} + \frac{y^2}{sinh^2v} = 1$ (ii) $\frac{x^2}{cos^2u} - \frac{y^2}{sin^2v} = 1$ 7M

UNIT–II

3. a) If $f(z)$ is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$ 7M

   b) Find the analytic function whose real part is $e^x\{(x^2-y^2)cosy - 2xy\ siny\}$ 7M

OR

4. Find the analytic fuction $f(z) = u+iv$, if $u+v = \frac{2sin2x}{e^{2y}-e^{-2y}-2cos2x}$ 14M

UNIT–III

5. a) Evaluate, using Cauchy's integral formula $\oint_C \frac{sin^2z}{\left(z-\frac{\pi}{6}\right)^3} dz$, where C is the circle $|z| = 1$ 7M

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

OR

6. a) Evaluate $\int_{1-i}^{2+3i}(z^2+z)\,dz$, along the line joining the points $(1,-1)$ and $(2,3)$ 7M

   b) Find the Laurents series expansion of $f(z) = \frac{1}{(z-1)(z-2)}$ in the region $1 < |z| < 2$ 7M

UNIT–IV

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

   b) Evaluate $\int_{-\infty}^{\infty} \frac{x^2}{(x^2+1)(x^2+4)} dx$ 7M

OR

8. a) Find the sum of the residues of $f(z) = \frac{sinz}{z\ cosz}$ at its poles inside the circle $|z| = 2$ 7M

   b) Use Rouche's theorem to show that the equation $z^5 + 15z + 1 = 0$ has one root in the disc $|z| < \frac{3}{2}$ and four roots in the annulus $\frac{3}{2} < |z| < 2$ 7M

UNIT–V

9. a) Find the bilinear transformation which maps the points $z = 1, i, -1$ onto $w = 2, i, -2$ 7M

   b) Prove that the tranformation $w = e^z$ 7M

OR

10. a) Prove that the tranformation $w = sinz$ 7M

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

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Hall Ticket Number :										

R-15

Code: 5G246

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

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) Explain the interconnection of two port network in series and parallel Configurations? 10M
   b) Obtain the relation for reciprocity and symmetry in terms of ABCD parameters. 4M

OR

2. a) Develop the Z-parameter and *h*-parameter equivalent circuits. Also express the Y-parameters in terms of Z-parameters. 10M
   b) Express the relation between Y-parameters and ABCD parameters. 4M

UNIT–II

3. a) Explain in detail about the transients in R-L series circuit with DC Excitation? 8M
   b) A 500 nF capacitor is connected in series with a 100 kΩ resistor and the circuit is connected to a 50 V d.c. supply. Calculate (i) the initial value of current flowing, (ii) the value of current 150 ms after connection? 6M

OR

4. a) Briefly explain about transients in circuits? 4M
   b) Explain in detail about the transients in R-L-C series circuit with DC Excitation? 10M

UNIT–III

5. a) Classify and explain about stop band filters? 6M
   b) A low-pass filter section is required to have a nominal impedance of 450 Ω, a cut-off frequency of 150 kHz and a frequency of infinite attenuation at 160 kHz. Design an appropriate 'm-derived' T section filter? 8M

OR

6. a) Derive the design equations for Bridged T- type attenuator? 8M
   b) A π-section attenuator has a series resistance of 500 Ω and shunt resistances of 2 kΩ. Determine (i) the characteristic impedance, and (ii) the attenuation produced by the network? 6M

UNIT–IV

7. a) A DC generator has an armature EMF of 100 V. When the useful flux per pole is 20 mWeb and the speed is 800 rpm. Calculate the generated EMF: (i) With the same flux and a speed of 1000 r.p.m. (ii) With a flux per pole of 20 mWeb and a speed of 900 r.p.m? 4M
   b) Explain different characteristics of DC shunt and series motors? 10M

OR

8. a) Explain different types of DC generators? 8M
   b) Explain the importance and working of a three point starter used in dc motor? 6M

UNIT–V

9. a) The following test results were obtained on a 4 kVA, 200 V/400 V, 50 Hz single phase transformer. The OC/SC Test results are as follows:
   OC Test: 200 V 0.8 A 70 W (LV side)
   SC Test: 20 V 10 A 60 W (HV side)
   Calculate the efficiency at full load current, 0.8 lagging power factor. 4M
   b) Derive the EMF equation and the condition for maximum efficiency of a 1-phase transformer? 10M

OR

10. a) What are the important types of capacitor start induction motors? 6M
    b) Explain briefly about the stepper motors? Write its applications? 8M

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Hall Ticket Number :										

R-15

Code: 5G344

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

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) Define "Electric Field", " Electric Potential" and "Electric Flux Density" from charge and Explain. 6M

   b) A circular ring lying on x-y plane having 5 cm radius is charged uniformly with the total charge of Q Coulombs. Find Electric field intensity at a point 10cm along z- axis. 8M

OR

2. a) Using Gauss's law derive the expression for electric field intensity and electric field density due to an infinite sheet of conductor of charge density ρ_s C/m^2 7M

   b) Given the flux density D= (16/r).cos(2θ) $\mathbf{a_\theta}$ C/m^2, Find the total charge within the region 1<r<2m, 1<φ <2 rad. 7M

UNIT–II

3. a) Define the term polarization. With necessary explanations give the relation between the electric flux density and electric field intensity with respect to a dielectric medium. 6M

   b) The dielectric sphere (ε_r=5.7) of radius 10 cm has a point charge 2 pC placed at its centre.

      i) Calculate the surface charge density of the polarization charge on the surface of the sphere.

      ii) The force exerted by the charge on a -4pC point charge on the sphere. 8M

OR

4. a) What is continuity equation and state its importance. 7M

   b) Find the capacitance of a 50 cm long coaxial cable, having conductors of 4cm and 2cm diameters separated by a medium of relative permittivity 2.4. Also find the stored energy and field at a radius of 1.5 cm in the dielectric when 10V is applied 7M

UNIT–III

5. a) With necessary mathematical expressions derive the magnetic field intensity due to finite and infinite lines. 8M

   b) A toroidal ring has 200 turns. The outer diameter of the ring is 15 cm with the inner diameter of 12 cm. Find the flux density if the current is 8A 6M

OR

6. a) Define and derive the Maxwell's curl equation involving Faraday's Law. Explain the concept of displacement current. 7M

   b) State and prove boundary equation for magnetic field between a dielectric and a dielectric medium 7M

UNIT–IV

7. a) What is a Poynting Vector, Give the physical interpretation? Does the pointing theorem apply to static field? Explain. 7M

   b) In a medium characterized by $\sigma=0$, $\mu=\mu_o$, ε_o and $E=20\sin(10^8t-\beta z)\,\mathbf{a_y}$ V/m. Calculate β and H. 7M

OR

8. a) Derive the expressions for reflection and transmission coefficients, when an perpendicularly polarized electromagnetic wave incidents obliquely on surface of a perfect dielectric 8M

   b) An EM wave travels in Free space with the electric field component $E_s= 100\, e^{j(0.866y+0.5z)}\,\mathbf{a_x}$ V/m. Determine the
      a) Ω and λ
      b) The magnetic field component 6M

UNIT–V

9. a) Derive the input impedance of the lossless transmission line. Evaluate Zsc and Z_{oc}. 8M

   b) Discuss impedance matching and discuss about the various matching technique. 6M

OR

10. a) What is Smith Chart? Explain its important features. 6M

    b) An unknown load is connected to a 75Ω transmission line (lossless). Find the load that is connected if the location of the 1st minima is at a distance of 0.25λ away from the load and SWR is found to be 4. Then what is load impedance & load reflection coefficient 8M

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Hall Ticket Number :										

R-15

Code: 5G342

II B.Tech. II Semester Supplementary Examinations Nov/Dec 2018

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) Derive the expression for the output of a high-pass circuit excited by exponential input and ramp for different time constants. 8M

   b) A 20 Hz symmetrical square wave whose peak to peak amplitude is 1V is impressed upon a high –pass RC circuit whose lower 3-dB frequency is 10Hz. Calculate and sketch the output waveform for the first two cycles. What is the peak-to-peak output amplitude under steady-state conditions? 6M

OR

2. a) Define following
   - i. Transmission Error
   - ii. Percentage tilt
   - iii. Attenuator.
   - iv. Over compensation
   - v. Linear wave shaping
   - vi. integrator

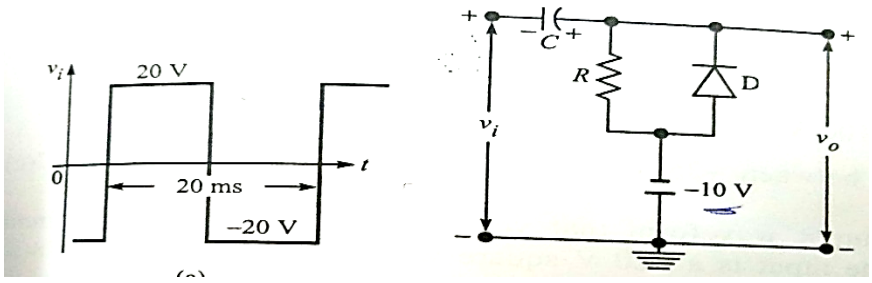
   6M

   b) A square wave whose peak-to-peak value is 1V extends ± 0.5V with respect to ground. The duration of the positive section is 0.1 sec and of the negative section is 0.2 sec. if this wave form impressed upon an RC differentiating circuit whose time constant is 0.2s, what are the steady-state maximum and minimum values of the output waveform? Prove that the area under the positive section equals that under negative section of the output waveform. What is the physical significance of the result? 8M

UNIT–II

3. a) Give the circuits of different types of shunt clippers and explain their operation with the help of their transfer characteristics. 6M

   b) State and prove clamping circuit theorem. Sketch the output waveform that you would expect from the circuit shown in figure.

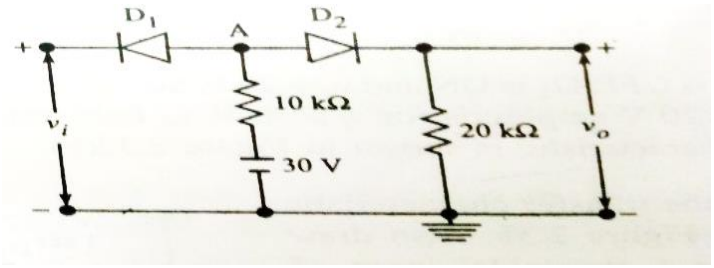


8M

OR

4. a) Explain transfer characteristics of emitter coupled clipper and derive necessary equations. 6M

   b) Draw the transfer characteristics for the clipper circuit shown. Assume ideal Diodes.



8M

UNIT–III

5. a) Explain and Derive the expression for frequency of oscillation of an Astable multi vibrator. 8M

   b) Design a collector coupled Astable multivibrator using NPN silicon transistors with h_{fe}=40, r_{bb}=200 supplied with V_{cc}=10V and circuit component values are R_c=1.2K and C=270 pF. 6M

OR

6. a) Explain the operation of a Monostable multivibrator and derive for the pulse width with necessary waveforms & circuits. 6M

   b) Design a symmetric collector-coupled astable multivibrator to generate a square wave of 10 kHz having peak-to-peak amplitude of 10 V where, h_{FE} min = 30, V_{CE}(sat) = 0.2 V, I_C(sat) = 2 mA 8M

UNIT–IV

7. a) Define and derive the terms slope error, displacement error and transmission error. 8M

   b) In the transistor bootstrap circuit, V_{CC}=25V, V_{BE}=-15V, R= 10kΩ, R_E = 15KΩ, R_B = 150KΩ, C= 0.05 μF, and C_1 =100 μF. the gating waveform has a duration Tg =300μS. The transistor parameters are h_{fe} = 1.1 KΩ, h_{re} =2.5X10^{-4} kΩ h_{fe} = 50, h_{oe} = 1/40 kΩ

      a) Draw the waveforms of I_{C1} and V_O
      b) What is the slope error of the sweep
      c) What is the retrace time for C discharge completely? 6M

OR

8. a) How is deviation of linearity expressed? What do you mean by sweep time and restoration time? 6M

   b) How a compensation circuit improves the linearity of a Bootstrap voltage time base generator? Discuss. 8M

UNIT–V

9. a) Realize a NAND gate using DTL and TTL logic. 8M

   b) How pedestal is reduced in a gate circuit? Explain. 6M

OR

10. a) What are the limitations of bidirectional sampling gates explain the operation of four diode sampling gate. 6M

    b) Explain about unidirectional diode sampling gate. Write its advantages and disadvantages. 8M

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