Code: 7G341

II B.Tech. II Semester Supplementary Examinations April 2023

Random Variables and Random Processes
(Electronics and Communication Engineering)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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Marks

UNIT–I

1. a) A dice is thrown 6 times. Find the probability that a face 3 will occur at least two times. 7M
   b) Discuss the relative frequency approach and axiomatic approach of probability 7M

OR

2. a) State and prove Bayes Theorem. 7M
   b) In a box there are 100 resistors whose resistances and tolerances are as shown in the table below. Let A be the event of drawing a 47 resistor, B be the event of drawing a resistor with 5% tolerance, and C be the event of drawing a 100 resistor. Find P(A/B), P(A/C) and P(B/C). 7M

UNIT–II

3. a) The characteristic function for a Gaussian random variable X, having a mean value of 0, is $\Phi_X(\omega)$ =EXP(-sigma ^{2}/w ^{2}) Find all the moments of X using $\Phi_X(w)$ 8M
   b) Explain about characteristic function in detail 6M

OR

4. a) Explain about Moments about the origin and Central Moments with necessary equations 7M
   b) Derive expressions for mean and variance for uniform random variable? 7M

UNIT–III

5. a) Justify the statement "The density function of the sum of two statistically independent random variables is the convolution of their individual density functions" 8M
   b) Prove the following statement: Var (ax+by) = a^2 var(x) + b^2 var(y) + 2ab cov(x,y) 6M

OR

6. a) Explain covariance of two random variables. 6M
   b) Explain the joint conditional density function with relevant expressions 8M

UNIT–IV

7. a) X(t)=2ACos(Wct+2θ) is a random Process, where ' θ ' is a uniform random variable, over (0,2π). Check the process for mean ergodicity 7M
   b) Show that the autocorrelation function of a stationary random process is an even function of τ 7M

OR

8. a) Discuss about Statistical independence with respect to random processes 7M
   b) Classify random processes and explain. 7M

UNIT–V

9. a) Discuss the relation between power spectrum and auto correlation function 7M
   b) Find the cross-correlation function for a cross-power density spectrum given below:
   $$f_{XY}(\omega) = \frac{8}{(\alpha+j\omega)^3}$$ 7M

OR

10. a) Discuss properties of cross power density spectrum 7M
    b) Prove the equation $S_{XY}(W) = S_{YX}(-W)$. 7M

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Code: 7GC43

II B.Tech. II Semester Supplementary Examinations April 2023
Complex Variables & Special Functions
(Common to EEE and ECE)

Max. Marks: 70   Time: 3 Hours

Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)

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Marks

UNIT–I

1. Separate the real and imaginary parts of $Tan\, h\, z$ 14M

OR

2. a) Symmetry of Beta function B(m, n)=B(n, m)   7M

   b) Evaluate $\int_0^1 \frac{x^2}{\sqrt{1-x^5}}dx$ in terms of B function   7M

UNIT–II

3. Prove that $\left(\frac{\partial^2}{\partial x^2}+\frac{\partial^2}{\partial y^2}\right)\left|\mathrm{Re}\,al\, f(z)\right|^2 = 2\left|f'(z)\right|^2$ where $w=f(z)$ is analytic.   14M

OR

4. a) Show that $f(z)=z+2\bar{z}$ is not analytic anywhere in the complex plane.   7M

   b) Determine whether the function $2xy+i(x^2-y^2)$ is analytic.   7M

UNIT–III

5. Expand $f(z)=\frac{1}{z^2-3z+2}$ in the region $(1)\; 0<|z-1|<1$ $(2)\; 1<|z|<2$ 14M

OR

6. Evaluate $\int_c (y^2+2xy)dx+(x^2-2xy)dy$ where c is the boundary of the region by

   $y=x^2\; and\; x=y^2$ 14M

UNIT–IV

7. Find the Residue of $\frac{z^2-2z}{(z+1)^2(z^2+1)}$ 14M

OR

8. a) Find the poles and Residues at each pole $\frac{ze^z}{(z-1)^3}$ 7M

   b) Use Residue theorem to find the number of zeros of the polynomial
   $z^{10}-6z^7+3z^3+1$ if $|z|<1$ 7M

UNIT–V

9. Find the bilinear Transformation which maps the points $(-i,\, 0,\, i)$ into the
   points $(-1,\, i,\, 1)$ respectively.   14M

OR

10. Show that the transform $w=\frac{2z+3}{z-4}$ changes the circle $x^2+y^2-4x=0$ into
    the straight line 4u+3=0   14M

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Code: 7G342

II B.Tech. II Semester Supplementary Examinations April 2023
Pulse and Digital Circuits
(Electronics and Communication Engineering)

Max. Marks: 70   Time: 3 Hours
Answer *any five full questions* by choosing one question from each unit (5x14 = 70 Marks)
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Marks

UNIT–I

1. 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?   14M

OR

2. a) Draw the output waveform of a Low Pass RC circuit excited by step and pulse signals with different time constants   10M
    b) Show that how High Pass RC circuit acts as a differentiator   4M

UNIT–II

3. a) Explain shunt and series clippers circuits with suitable waveforms   10M
    b) What are the applications of Voltage Comparators   4M

OR

4. a) State and Prove the clamping circuit theorem.   8M
    b) Explain the operation of a two level diode clipper with the help of circuit diagram?   6M

UNIT–III

5. Derive UTP and LTP of Schmitt trigger circuit.   14M

OR

6. Design a Monostable multivibrator circuit that produces a pulse width of 10 m sec. Assume hfe=30, VCE(sat)=0.3V, VBEsat=0.7V Ic=5mA, Vcc=6V. VBB=1.5V, Q1 ON and Q2 OFF   14M

UNIT–IV

7. a) What do you mean by Voltage Time Base Generator and Current Time Base Generator   4M
    b) How to generate sweep circuit by using UJT explain with neat diagrams   10M

OR

8. a) Derive the expressions for Slope error (e_s), Displacement error (e_d), Transmission error (e_t)   10M
    b) Distinguish the Miller and Bootstrap time base generators   4M

UNIT–V

9. a) Define the following:
       i) Propagation delay ii) Fan-in iii) Fan-out iv) Noise margin   8M
    b) Compare various logic families   6M

OR

10. a) Explain the working of Two input TTL NAND gate with neat sketches   7M
    b) Explain the working of Two input ECL OR/NOR gate with neat sketches   7M

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