FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II – Semester (Main & Backlog) Examination, May / June 2017

Subject: Analog Electronics Circuits

Time: 3 Hours

Max. Marks: 75

Note: Answer all questions from Part – A and any five questions from Part – B.

PART – A (25 Marks)

1. Draw high frequency Pi model of BJT.
2. Calculate input impedance for a CE amplifier without bypass capacitor, given 
   $h_{ie} = 1.1$ Kohms and $h_{fe} = 100$ and $R_e = 1$ Kohm.
3. Given that gain with feedback is 100, gain without feedback is 1000. Calculate Beta.
4. What is effect of negative feedback on stability of amplifier?
5. What is Barkhausen's criteria for oscillations.
6. Give difference between series and shunt regulators.
7. What is a power amplifier, how is it different from voltage amplifier.
8. Calculate the efficiency of a Class A direct coupled power amplifier given $V_{min} = 0.25$ V 
   and $V_{max} = 2.5$ V.
9. For a single tuned RF amplifier, calculate $f_0$ if $L = 10$ mH and $C = 0.1$ pF.
10. What is the effect of $C_b'c$ on an RF amplifier?

PART – B (5x10 = 50 Marks)

11 a) Obtain expression for gain of transformer coupled amplifier at the mid frequency.
11 b) Draw a single state RC coupled common emitter BJT amplifier circuit and calculate 
     it’s $A_1$, $A_v$, $R_i$, $R_o$, $A_{IS}$ and $A_{VS}$. Given $R_c = 5$ Kohm, $R_1 = 75$ K ohm, $R_2 = 15$ Kohm, 
     $R_s = 1$ Kohm, $R_L = 5$ Kohm. Use approximate model and consider $h_{ie} = 2$ Kohms and $h_{fe} = 100$.

12 a) Draw an emitter follower circuit and show that its gain with feedback is unity.
12 b) Obtain general expression for $R_{if}$ for current series feedback amplifier.

13 a) Give the circuit of a wein bridge oscillator and obtain its oscillating frequency.
13 b) Draw a Hartley oscillator and calculate $f_0$, given $L_1 = 2$ mH, $L_2 = 5$ mH and $C = 10$ nF.

14 a) Explain the operation of class B push pull amplifier and show that even harmonics 
     are cancelled in push pull amplifier.
14 b) Compare between Class A, Class B and Class C power amplifier.
FACULTY OF ENGINEERING
B.E. 2/4 (ECE) II – Semester (Main) Examination, May/June 2017
Sub: Networks and Transmission Lines

Time: 3 Hours
Max. Marks: 75

Note: Answer all questions from Part – A and any five questions from Part – B.

PART – A (25 Marks)
1. Define iterative and Image impedances of a asymmetrical network.
2. What are passive four terminal networks? Give the properties of the network.
3. What are the limitations of constant –k filters. How are the limitations overcome?
4. Draw and bring out the characteristic of Notch filter.
5. What are the properties of Positive Real Function?
6. What are Inverse networks? Give example.
7. What type of distortions exist in transmission lines.
8. Write on important specifications of telephone cable.
9. Why is a one fourth wavelength TL act as a impedance inverter.
10. Define phase and group velocity.

PART – B (5x10 = 50 marks)
11. a) Differentiate symmetrical and asymmetrical networks and explain the propagation and impedance parameters.
   b) Find the Open and Short circuit impedances of a T network.
      Prove the product of Zoc and Zsc is equal to Zo^2

12. a) Derive the relation for conversion of T-n network
    b) Given Zoc = 800 ohms and Zsc = 600 ohms for a T network, find the parameters R1 and R2. Draw the circuit.

13. a) What is the optimum value of 'm' in m-derived filters. How is the value decided
    b) Design a low pass composite filter with fc= 2000 hz, fa=2050 hz and Rk = 500 ohms

14. a) List the electrical characteristics of attenuators. Explain the difference between Decibel and Neper.
    b) Why are matching networks required? Draw and Explain the design criterion of 'L' matching network.

15. a) What are Primary and Secondary parameters of a Transmission line.
    Obtain attenuation and phase constants in terms of Primary and Secondary parameters.
    b) Derive the condition for distortion-less transmission line.

16. a) Briefly explain the characteristics of 1/8 and 1/2 wavelength Transmission lines.
    b) For a low loss line with Zo= 70 ohms, Zr=115-j80. Find the following:
       i) Standing wave ratio
       ii) Maximum and minimum Line impedance.

17. Write notes on the following:
   a) Campbell formula
   b) Single and Double stub matching

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Faculty of Engineering
B.E. 2/4 (ECE) II - Semester (Main) Examination, May / June 2017
Subject: Probability Theory and Stochastic Processes

Note: Answer all questions from Part-A and answer any five questions from Part-B.

Part-A (25 Marks)

1. Two aeroplanes bomb a target in succession. The probability of each correctly scoring a hit is 0.3 and 0.2 respectively. The second will bomb only if the first misses the target. Find the probability that (i) the target is hit (ii) both fails to score the hits.

2. If probability density function is defined as \( f(x) = kx^3 \) in \( 0 \leq x \leq 3 \), 0 elsewhere. Find the value of \( k \).

3. Define moment generating function and characteristic function.

4. Determine the given function is valid PSD \( e^{-(\omega^2/2)} \).

5. Define ergodicity and write its importance.

6. \( x \) and \( y \) are two random variables such that
   \[x = 1 \text{ with probability } 1/3 \quad y = 2 \text{ with probability } 3/4 \]
   \[0 \text{ with probability } 2/3 \quad -3 \text{ with probability } 1/4 \]. Find \( E [2x^2 - Y^2] \).

7. List the properties of the joint density and distribution function.

8. \( x \) and \( y \) are two independent random variables whose moments are \( \mu_{10} = 12 \), \( \mu_{20} = 24 \), \( \mu_{02} = 22 \) and \( \mu_{22} = -16 \). Find the moment \( \mu_{11} \).

9. Define PSD function of a stationary random process.

10. The mean and variance of the binomial variable \( x \) with parameters \( n \) & \( p \) are 16 and 8. Find \( P(x \geq 1) \) and \( P(x > 2) \).

Part-B (50 Marks)

11. (a) Box 1 contains 1000 bulbs of which 10% are defective. Box 2 contains 2000 bulbs of which 5% are defective. Two bulbs are picked from a randomly selected box.
   (a) Find the probability that both bulbs are defective. (b) Assuming both are defective, find the probability that they came from B be defective.

   (b) 10% of the bolts produced by a certain machine turn out to be defective. Find the probability that in a sample of 10 bolts selected at random, exactly two of them will be defective using (i) Binomial distribution (ii) Poisson distribution and comment on result.

12. Find the mean and variance of a random variable \( x \) which is Poisson distributed.

13. (a) The joint probability of density two random variable \( x \) and \( y \) is
   \[
f_{xy}(x,y) = \begin{cases} 
  c(2x+y) & 0 \leq x \leq 1 \text{ and } 0 \leq y \leq 2 \\
  0 & \text{otherwise}
\end{cases}
\]
   Find (i) the value of 'c' (ii) marginal distribution functions of \( x \) & \( Y \).

   (b) The joint probability of density two random variables \( x \) and \( y \) is
   \[
f_{xy}(x,y) = \begin{cases} 
  1 & -1/2 \leq x \leq 1/2 \text{ and } -1/2 \leq y \leq 1/2 \\
  0 & \text{Elsewhere}
\end{cases}
\]
   Find \( \phi(x(w_1), \phi(y(w_2), \phi_{xy}(w_1, w_2)) \).

14. (a) The first, second and third moments of probability distribution about the point are 1, 16, 40 respectively. Find the mean, variance and the third central moment.

   (b) The joint probability of density two random variables \( x \) and \( y \) is given by
   \[f_{xy}(x,y) = Ae^{[q(x)][y]} \text{ for } -\infty \leq x \leq \infty, -\infty \leq y \leq \infty\]
   Are \( x \) and \( y \) statistically independent.
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B.E. 2/4 (ECE) II – Semester (Main) Examination, May / June 2017

Sub: Signal Analysis and Transform Techniques

Time: 3 Hours Max.Marks: 75

Note: Answer all questions from Part – A and any five questions from Part – B.

PART – A (25 Marks)

1. A discrete time system is described by $y(n) = e^{x(n)}$, check the system for linearity, time invariance and stable.
2. What is aliasing effect?
3. List the properties of Continuous Time Fourier Transform.
4. Define Orthonormality and completeness.
5. State initial and final value theorems for Laplace Transform.
6. Write the properties of autocorrelation.
7. Find the average power of the signal $x(t) = (e^{t+1})u(t)$.
8. State any three properties of $Z$-transform.
9. Find out the linear convolution of $X(n) = \{1, 4, 3, -6\}$ with $h(n) = \{1, 7, -1, 3, 5\}$

10. Find whether the signal $x(t) = 2\cos(10t+1) - \sin(4t-1)$ is periodic or not.

PART – B (5x10 = 50 Marks)

11. a) Derive the condition for stability for LTI system.

   b) Explain the basic operations that can be performed on signals.

12. a) Explain the analogy between vectors and signals.

   b) Find the Fourier Transform of the signal $x(t)$ shown in the Fig.

13. a) Find the convolution of $x_1(t) = u(t+1)$ and $x_2(t) = u(t-2)$ where $u(t)$ is a unit step function.

   b) Find the Laplace transform of $x(t) = t^2e^{-2t}u(t)$.
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B.E. 2/4 (ECE) II-Semester (Main) Examination, May / June 2017
Subject : Switching Theory and Logic Design

Time : 3 hours  Max. Marks : 75

Note: Answer all questions from Part-A. Answer any FIVE questions from Part-B.

PART – A (25 Marks)

1. State and prove consensus theorem. 3
2. Convert the following octal numbers into binary and hexadecimal: \((5436.15)_8 = (\quad\quad)_2 = (\quad\quad)_16.\) 3
3. Define Prime implicant. 2
4. Realize two input XOR gate using only NAND gates. 3
5. List out the applications of multiplexer and demultiplexer. 3
6. Define Static hazards. 2
7. Convert D flipflop into JK flip flop. 3
8. Draw the state diagram for Jk flip flop. 2
9. What is meant by the 'lock out' in counter? 2
10. Write the applications of shift registers. 2

PART – B (50 Marks)

11. a) Construct an even parity seven bit hamming code to transmit the data 0100. 6
    b) Determine the Canonical SOP representation of the following function
       \(F(x, y, z) = \bar{z} + (x' + y)(x + y').\) 4

12. Minimize the following function using Quine Mc Cluskey method
    \(F(v, w, x, y, z) = \sum m(0,7,8,9,12,13,15,16,22,23,30,31).\) 10

13. Implement the following boolean function using IC 74151
    \(F(A,B,C,D) = \Sigma m(2,3,4,5,7,10,14)\) 10

14. Explain in detail how master slave JK flip flop avoids the race around condition. 10

15. Design a mod 128 counter using 7493 IC’s. 10

16. a) Realize full adder using only two input NAND gates and verify its functionality using truth table. 5
    b) Define set up and hold time. Explain in detail how to avoid meta stable state of sequential logic circuit? 5

17. Write short notes on:
    a) Hazard free circuit 10
    b) Shift registers
    c) Parity code

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