PART – A (25 Marks)

1. Write briefly about classification of amplifiers?
2. What are the advantages and disadvantages of transformer coupled amplifier?
3. What are the characteristics of negative feedback in amplifiers?
4. Write about stability of feedback amplifiers?
5. Compare LC and RC oscillators?
6. Derive relation between series and parallel resonant frequency of the crystal?
7. What is cross-over distortion in power amplifiers-Explain?
8. Explain class-D operation in power amplifier?
9. What is a staggered tuned amplifier? Write its advantages?
10. What are the limitations of zener voltage regulator?

PART – B (5x10 Marks)

11. Draw the circuit of transformer coupled FET amplifier and derive expression of $A_v$ at low and high frequencies? Show that frequency response is poor at high frequency?

12. For the amplifier circuit shown in fig(a), find $A_{vsf}$, $A_{isf}$ and $R_{if}$? Assume suitable data required.

Fig. (a)
13 Derive expressions for frequency of oscillation and condition of oscillations for a RC phase shift BJT oscillator.

14 Draw the circuit of transformer coupled class-A power amplifier and explain its operation? Find its efficiency?

15 Derive expressions for gain at resonance and bandwidth for a single tuned RF voltage amplifier?

16 a) For a RC coupled BJT amplifier derive expressions of $A_v$ at mid and high frequency (consider single stage)?

b) Evaluate the effect of $-ve$ feedback on input and output impedences of voltage shunt amplifier?

17 Write short notes on-
   a) Transistornised shunt regulator
   b) Stability in RF amplifiers
   c) Push-pull amplifier.
FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II – Semester (Old) Examination, May / June 2016

Subject: Analog Electronic Circuits

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. Write about classification of amplifiers.
2. Draw high frequency equivalent circuit of FET and explain.
3. What are the characteristics of negative feedback in amplifiers?
4. What is the effect of negative feedback on input and output resistances of transconductance amplifier?
5. State and explain Barkhausen criterion for oscillators.
6. Compare RC and LC oscillators.
7. Find efficiency of class-A audio power amplifier.
8. What is class-D operating – Explain?
9. What are the requirements of RF voltage amplifiers?
10. What are the advantages of push-pull power amplifiers?

PART – B (5x10 = 50 Marks)

11. Derive expressions for midband gain and bandwidth of two stage RC coupled FET amplifier.

12. For a single stage voltage shunt feedback amplifier it $R_c = 2 \text{ k ohm}, R_e = 1 \text{ k ohm}, R_f = 100 \text{ k ohm}, R_s = 1 \text{ k ohm}$ and $h_{fe} = 50$, Calculate $R_f$ and $R_{vst}$.

13. For RC phase shift FET oscillator, explain its operation and derive expressions for frequency of oscillations and condition of oscillations.

14. Explain with circuit the operation of class-B push-pull audio power amplifier and find efficiency.

15. Derive expressions for gain at resonance and bandwidth of single tuned RF voltage amplifier.

16. Derive midband gain and lower cutoff frequency and upper cutoff frequency for transformer coupled BJT amplifier.

17. Write short notes on:
   a) Transistorized series regulator
   b) Unilateralisation in RF amplifiers
   c) Local verses global feedback.

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FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II – Semester (New) (Main) Examination, June 2016

Subject: Networks & Transmission Lines

Max. Marks: 75

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

PART – A (25 Marks)

1. Show that the characteristic impedance of a symmetrical network is geometrical mean of its open circuit and short circuit impedances.

2. Define image impedance and iterative impedance of a asymmetrical network.

3. Derive the condition for a filter to lie in passband.


5. Test whether the polynomial \( P(S) = 2S^4 + 5S^3 + 6S^2 + 2S + 1 \) is Hurwitz?

6. Mention any two important functions of an equalizer.

7. What is loading of a line? What is the purpose of loading?

8. Define phase velocity and group velocity. Establish the relation between them.

9. A transmission line of 100 \( \Omega \) characteristic impedance is connected to a load of 200 \( \Omega \). Find VSWR and reflection coefficient.

10. What is the importance of normalized impedance? Where it is used?

PART – B (5x10 = 50 Marks)

11 a) A symmetrical \( \pi \)- network consists of a series arm of 300 \( \Omega \) and two shunt arms of 600 \( \Omega \) each. Determine the characteristic impedance and propagation constant of the network.

b) Obtain the expression for iterative impedance of asymmetrical \( T \)- network.

12 a) Design a constant K-band pass filter section having cutoff frequencies of 1000 Hz and 4000Hz and nominal characteristic impedance 600 \( \Omega \).

b) What is a composite filter? Draw its block diagram and mention the function of each section used in it.

13 a) A driving point impedance is given by

\[
Z(S) = S \left( \frac{S^2 + 4}{S^2 + 6} \right) \left( \frac{S^2 + 1}{S^2 + 5} \right).
\]

Obtain the first form of cauer network.

b) Design an L- matching loss less network to match 100\( \Omega \) Source to 50\( \Omega \) load at 5 MHz.

14 a) Find the input impedance of a transmission line terminated with any load impedance \( Z_R \). Hence show that it reduces to \( Z_0 \) if the load impedance is \( Z_0 \).

b) State and explain Campbell's formula for the loaded cables.
15 a) A load of $(26 - j 16)$ $\Omega$ is connected across a 100 $\Omega$ line. Design a short circuit stub in order to provide impedance matching between the two at a signal frequency of 100 MHz.

b) Show that quarter wave transformer acts as impedance inverter.

16 a) What is an attenuator? Derive the necessary equations for the design of a symmetrical $\pi$-attenuator.

b) Define reflection coefficient and voltage standing wave ratio and hence obtain the relation between them.

17 Write short notes on

a) Distortion less transmission line

b) Double stub matching
FACULTY OF ENGINEERING
B.E. 2/4 (ECE) II - Semester (Old) Examination, June 2016

Subject: Networks and Transmission Lines.

Time: 3 Hours
Max. Marks: 75

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

PART - A (25 Marks)

1. Define Characteristic Impedance of Network.
   (2)
2. Define Image, Iterative impedance and image, Iterative transfer constant.
   (3)
3. How will you select 'm' in m-derived filters.
   (3)
   (3)
5. What is relation between Reflection Coefficient K and Input Impedance Z_in.
   (2)
6. Specify reflection coefficient and SWR for
   (a) Short circuit
   (b) Open Circuit
   (c) Matched load.
   (3)
7. List properties of Positive Real Function.
   (3)
8. Write on the Characteristics of a quarter wave Transmission Line.
   (2)
9. Limitation of single stub matching section.
   (3)
10. List applications of Smith Chart.
    (3)

PART - B (5x10=50 Marks)

11 (a) Explain the terms Characteristic impedance, Propagation Constant.
     (4)
 (b) Design a symmetrical T network, attenuation of 20 dB and
     RK=600 ohms.
     (6)
12 (a) Draw T and π networks and list their properties.
     (4)
 (b) Given Z_A=200, Z_B=400 and Z_C=500 for a non-asymmetrical network,
     Calculate image impedances Z_I and Z_II
     Z_A, Z_B are series impedances and shunt impedance is Z_C
     (6)
13 (a) What are the characteristics of Low pass, High pass and pass band
     type of filters.
     (4)
 (b) Design a constant -(k type high pass filter, given R_K=600 ohms
     and f_c = 10000Hz
     (6)
14 (a) Design a composite filter with the following design requirements;
     F_C= 1000 Hz, f_infinity = 1200 Hz and R_0 = 600 Ω
     (10)
15 (a) Design a T-pad attenuator to give an attenuation of 15 dB and
     Characteristic impedance of 75 ohms.
     (6)
 (b) Write on the need and the type of Equalizers in networks.
     (4)
16 (a) What is an Infinite Transmission line. Show that a finite line
     terminated in Z_0 is equivalent to infinite line
     (5)
 (b) Give design equations and steps for a double stub matching
     by using Smith Chart.
     (5)
17 A low loss Transmission line has Z_0= 70 ohms and Z_r=115-j80.
 (a) Standing wave ratio.
     (10)
 (b) Maximum and Minimum line Impedance.
     (c) Distance between load and first voltage maximum.
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FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II - Semester (New) (Main) Examination, May 2016
Subject: Probability Theory and Stochastic Processes

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 the fundamental Axioms of Probability.
2. State Bernoulli’s theorem.
3. Define Cumulative Distribution Function (CDF) and state its properties.
4. A pair of dice is rolled. Find the probability of an event A defined as A = {sum of two dice = 7}.
5. What is a Gaussian Random variable?
6. If X is a discrete random variable, define the expectation of the random variable and the variance of the random variable.
7. Define the moment generating function of a continuous random variable X.
8. State the Central Limit theorem.
9. Define Autocorrelation function of a random process and state its properties.

PART – B (50 Marks)

11 a) State and prove the theorem of Total Probability.
    b) Manufacturer X produces personal computers (PCs) at two different locations in the world. Fifteen percent of PCs produced at location A are delivered defective to a retail outlet, while 5 percent of PCs produced at location B are delivered defective to the same retail store. If the manufacturing plant at A produces 1,00,000 PCs per year and the plant at B produces 1,50,000 PCs per year, find the probability of purchasing a defective PC.

12 a) Define probability density function (PDF) and state its properties.
    b) Determine the real constant ‘a’ for arbitrary real constants m and b > 0, such that \( f_x(x) = a e^{(x-m)/b} \) is a valid density function.

13 Let X be a Gaussian random variable with zero mean and variance \( \sigma^2 \). If Y = X^2 is the transformation. Find the new density function f_Y(y).

14 a) If X has the probability density function \( f_x(x) = \begin{cases} e^{-x} & x > 0 \\ 0 & \text{elsewhere} \end{cases} \) find the \( E \left[ e^{3x/4} \right] \).
    b) Find the density function of a random variable whose characteristic function is given by \( \phi_x(\omega) = \frac{1}{2} e^{-|\omega|}, -\infty \leq \omega \leq \infty \).
15 a) Define joint density function $f_{XY}(x, y)$ and write down the expression for getting the marginal density functions of $X$ and $Y$ using the joint density function $f_{XY}(x, y)$.

b) Suppose the random variables $X$ and $Y$ have a joint pdf given by
$$f_{XY}(x, y) = \begin{cases} 1 & 0 \leq x, y \leq 1 \\ 0 & \text{otherwise} \end{cases}$$
Find the marginal pdfs $f_X(x)$ and $f_Y(y)$ and check whether the random $X$ and $Y$ are statistically independent.

16 Suppose $X$ and $Y$ are statistically independent random variables, having PDFs given by $f_X(x) = a \exp(-ax)u(x)$ and $f_Y(y) = b \exp(-by)u(y)$ then find the PDF of a new random variable given by $Z = X + Y$.

17 Consider a random process $X(t) = \cos(\omega_0 t + \theta)$ where $\theta$ is a uniform random variable in the interval $[0, 2\pi]$.

a) Check whether the random process is wide sense stationary.

b) Check whether the random process is ergodic in mean and autocorrelation.
FACULTY OF ENGINEERING
B.E. 2/4 (ECE) II – Semester (New) (Main) Examination, June 2016
Subject: Signal Analysis and Transform Techniques

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. Show that the complex exponential sequence \( x(n) = e^{j\omega_n} \) is periodic iff \( \left( \frac{\omega_0}{2\pi} \right) \) is a rational number.

2. Determine the following signals are energy or power.
   a) \( x(t) = \text{Rect}(t / \tau) \)
   b) \( x(t) = A \delta(t - t_0) \)

3. Show that the functions \( \sin n\omega_0 t \) and \( \cos n\omega_0 t \) are orthogonal over any interval \([t_0 \text{ to } t_0^+ \frac{2\pi}{\omega_0}]\).

4. What are the merits and limitations of Fourier transform?

5. Find the convolution of signals \( x_1(t) = 2e^{2t} u(t) \) and \( x_2(t) = u(t) \) using Fourier transform.

6. Obtain relationship between convolution and correlation.

7. Distinguish between Fourier transform versus Laplace transform.

8. Given \( x(n) = u(-n-2) \) and \( x(n) = 2^n u(n-2) \) find \( z \)-transform for both the signals.

9. Show that for a stable system the ROC of a system function includes unit circle.

10. Given \( H(z) = \frac{3 + z^{-1}}{1 + z^{-1} - \frac{4}{9} z^{-2}} \), find \( h(n) \).

PART – B (5x10 = 50 Marks)

11. a) Check the stability of the following system
    a) \( h(n) = 2^n u(n) \)
    b) \( y(n) = x(n) + \frac{1}{2} x(n-1) + \frac{1}{4} x(n-2) \)
    c) \( y(n) = ax(n-7) \)

   b) Comment about linearity, causality and time invariance of the system given
   \( y(n) = 2x(n+1) + [x(n-1)]^2 \).
12 a) A rectangular function is defined as

\[ x(t) = \begin{cases} 
A & \text{for } 0 < t < \frac{\pi}{2} \\
-A & \text{for } \frac{\pi}{2} < t < \frac{3\pi}{2} \\
A & \text{for } \frac{3\pi}{2} < t < 2\pi 
\end{cases} \]

approximate above function by \( A \cos t \) between \([0, 2\pi]\) such that mean square error is minimum.

b) Find Fourier series for the periodic waveform \( x(t) = \begin{cases} 
A \sin wt, & 0 \leq t \leq \pi \\
0, & \text{otherwise} 
\end{cases} \).

13 a) Find the average power of the signal \( x(t) = \cos^2 (5000 \pi t) \sin (20000 \pi t) \) if the signal is transmitted through a telephone system which blocks dc and above 14 kHz compute the ratio of received power to transmitted power.

b) Explain the concept of Gibb's phenomenon.

14 Find the Fourier series coefficient \( C_n \) for the signal \( x(t) = \sum_{n=-\infty}^{\infty} \delta \left( t - \left( \frac{1}{2} \right)n + \delta \left( t - \frac{3}{2} \right) \right) \) also sketch the amplitude and phase spectra.

15 The input and output of a causal LTI system are related by the difference equation

\[ \frac{d^2 y(t)}{dt} + 5 \frac{dy(t)}{dt} + 6y(t) = x(t) \]

a) Find impulse response of the system.

b) What's the response of this system if \( x(t) = e^{-t} u(t) \).

16 a) Find the autocorrelation of the signal \( x(t) = A \sin (w_0 t + \theta) \).

b) The signal \( x(t) = [\cos w_0 t + 2 \sin 3 w_0 t + 0.5 \sin (4 w_0 t)] \) is filtered by an RC low pass filter with a 3dB frequency \( f_c = 2f_0 \). Find output power \( s_o \).

17 Write short notes on the following:

a) Laplace transform versus z-transform

b) Initial and final value theorems in z-domain

c) State Dirichlet conditions.
FACULTY OF ENGINEERING

B.E. 2/4 (ECE) II – Semester (Old) Examination, June 2016

Subject: Signal Analysis and Transform Techniques

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. Determine whether the following signals are Energy or Power signals.
   a) \(x(t) = t u(t)\)
   b) \(x(t) = \text{Rect}(\frac{t}{\tau})\).

2. Determine the signal \(x(t) = (3 \sin 200\pi t + 4 \cos 100 t)\) is periodic or not.

3. State Dirichlet conditions for a continuous time domain signal which is periodic.

4. State and prove final value theorem in s-domain.

5. Find final value and initial values of the signal if \(X(s) = \frac{s}{(s+1)(s+2)}\).

6. Find the Z-transform of \(a^n u(n), n \geq 0\).

7. Find the transfer function and impulse response of the system described by difference equation \(y(n) - \frac{1}{3} y(n-1) = 4x(n-1)\).

8. Find the DTFT of the following sequences:
   a) \(x(n) = \left(\frac{1}{2}\right)^n \sin \left(\frac{n\pi}{4}\right) u(n)\)
   b) \(x(n) = \cos \left(\frac{n\pi}{3}\right) u(n)\)

9. Find the auto correlation of the signal \(x(t)\), where \(x(t) = A \sin(\omega_0 t + \theta)\).

10. Define and prove convolution theorem in Z-domain.

PART – B (5x10 = 50 Marks)

11. a) Show that the functions \(\sin(n\omega_0 t)\) and \(\cos(n\omega_0 t)\) are orthogonal over any interval \([t_0, t_0 + 2\pi/\omega_0]\).
   b) Estimate the mean square error value of a function \(x(t)\).

12. a) Determine the Fourier series representation of signal \(x(t)\); where \(x(t) = 3 \cos[\pi t + \pi / 4]\).
   b) State and prove the time differentiation property in Fourier Transform.

13. a) The system function of a Causal LTI system is \(H(s) = \frac{s + 1}{(s^2 + 2s + 2)}\). Determine the response \(y(t)\) when the input \(x(t) = e^{-|t|}\).
   b) A system is described by the differential equation \(\frac{d^2 y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 4y(t) = x(t)\).
   Determine the response of the system to an input \(x(t) = e^{\alpha t} u(t)\) at \(t=0\); initial conditions are \(y(0) = -2\) and \(\frac{dy}{dt}(0) = -1\).
14 a) State and prove Frequency Convolution Theorem.
    b) Find the convolution of the signals \( x_1(t) = e^{-at}u(t) \) and \( x_2(t) = e^{bt}u(t) \) using Fourier transform.

15 a) Determine the Energy Spectral Density (ESD) of a gate function of width \( \tau \) and amplitude \( A \).
    b) Obtain relationship between auto correlation function \( R(\tau) \) and Power Spectral Density (PSD).

16 Find the Z-transform of the following signals and plot ROC.
    \[ 4 \times 2 \frac{1}{2} \]
    a) \( x(n) = a^n u(-n) \)
    b) \( x(n) = \left[ 3 \left( \frac{5}{7} \right)^n u(n) + 2 \left( -\frac{1}{3} \right)^n u(n) \right] \)
    c) \( x(n) = \left( \frac{1}{2} \right)^n u(-n) - 2^n u(-n-1) \)
    d) \( x(n) = \left( \frac{1}{4} \right)^n \cos \left( \frac{\pi}{3} \right) n u(n) \)

17a) A casual and stable LTI system has the property that \( \left( \frac{4}{5} \right)^n u(n) \rightarrow n \left( \frac{4}{5} \right)^n u(n) \).
    Determine the frequency response \( H(\omega) \) of the system. Also determine difference equation relating input \( x(n) \) with respect to output \( y(n) \).
    b) Find the frequency response of a casual system
    \[ y(n) - y(n-1) + \frac{3}{16} y(n-2) = x(n) - \frac{1}{2} x(n-1). \]
FACULTY OF ENGINEERING
BE 2/4 (ECE) II Semester (New) (Main) Examination, June -2016.

Sub: Switching Theory & Logic Design.

Max. Marks : 75

Note: Answer All Questions From Part-A and Any Five Questions from Part-B.

PART - A' (25 Marks)

1. Convert the following decimal numbers into their octal equivalents: (34)_{10}, (66.38)_{10} (2)

2. Reduce the following expression using Boolean algebra: \( f = xy + yz + x'z \). (3)

3. Realize an Exclusive OR gate using minimum number of NAND gates only. (2)

4. Realise \( f + (a+b).(c+d) \) using NOR gates only. (2)

5. Design a 3-bit even parity generator circuit? (3)

6. Briefly explain how to avoid static hazards? (2)

7. What is race-around condition? How to avoid it? (3)

8. Define Set-up time and hold time of a flip-flop. (2)

9. Define State diagram and state table. (2)

10. List out the differences between Asynchronous and synchronous counters? (3)

PART - B (50 Marks)

11. Simplify the following three variable Boolean expressions using Boolean algebra
   (a) \( f(a, b, c) = \Sigma m(0,1,3,4,7) \)  (b) \( g(x,y,z) = \pi M (1,3,5,7) \) (5+5)

12. a) Using K-map obtain the minimal SOP expression for the given switching function and implement it using basic logic gates.
   \( f(a,b,c,d) = \Sigma m(0,2,6,9) + d(3,7,10,11,14,15) \) (5)
   b) Simplify the given expression using Quine- McCluskey method.
   \( f(w,x,y,z) = \Sigma m (1,3,5,10,11,12,13,14,15) \) (5)

13. a) Design a full adder and implement it using 74138 IC ? (5)
    b) Design and implement 2-bit comparator circuit using suitable gates. (5)

14. a) With a neat diagram explain operation of JK flip-flop and derive its truth table, excitation table and characteristic equation. (5)
    b) Convert a T flip-flop into D flip-flop using standard procedure. (5)

15. a) Design a Mod-5 synchronous counter using T flip-flops ? (5)
    b) Design a 3-bit bidirectional shift register using JK flips-flops having right and left data inputs and Mode control M such that M=0 left shift. (5)

16. a) Design a BCD to 7-segment decoder circuit ? (5)
    b) Explain about Carry look-ahead adder in detail ? (5)

17. a) Simplify the following Boolean expression using 4-variable maps.
    \( f=x'z+w'xy'+w(w'y+xy') \) and implement using NAND logic ? (5)
    b) Find the compliment of the function \( f=x+y+z \), then show that \( f, f' =0 \) and \( f + f' =1 \). (5)

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FACULTY OF ENGINEERING
BE 2/4 (ECE) II Semester (Old) Examination, June -2016.

Time : 3 Hrs. Max. Marks : 75

Sub: Pulse, Digital and Switching Circuits.

Note : Answer All Questions From Part- A and Any Five Questions from Part-B.

PART – 'A' (25 Marks)

1. Show that a Low Pass RC Circuit can function as an Integrator circuit?
2. State Clamping Circuit Theorem ?
3. Draw the circuit of compensating attenuator and explain ?
4. Explain how a voltage to frequency converter works with a neat circuit diagram?
5. State a prove DeMorgan's Theorem ?
6. Define Prime Implicants & essential prime Implicants ?
7. Realize Half Subtractor using NAND gates ?
8. Draw the logic diagram & Truth table of SR, JK and T Flip Flops ?
9. Convert 'D' Flip Flop to "T" Flip Flop ?
10. Distinguish between state table and Excitation table ?

PART – B (50 Marks)

11. a) Why a High Pass RC circuit is called a differentiator ?
   b) 1 KHz symmetrical square wave of ± 10 V is applied to Low Pass RC circuit having 1 ms time constant. Calculate and plot the output ?

12. a) Design collector coupled mono stable multi vibrator using a NPN transistor. Neglect $I_{CEO}$ and the Junction voltages. Assume $h_{IE(min)}=20$, $V_{BE}=-1V$ for the transistor in cut-off and $I_{B}=1.5 I_{B(min)}$ for the transistor in saturation, $V_{cc}=8V$, $I_{C(max)}=2mA$ $T=2ms$, and $R1=R2$, find $R_c,R,V_{BB},R_1$ and $C$ ?

13. a) Design a full adder circuit ? Implement it using 3 to 8 decoder circuit ?
   b) Minimize the following function by K-Map Method :

$$f(a,b,c,d,e)= \Sigma_m (1,2,3,8,9,10,11,12,13,14,15,16,17,18,22,23,26,27) +$$

$$\Sigma +0,4,11,19,28,30,31)$$

14. a) Explain hazards in Digital Circuit with examples ?
   b) Design a Code Converter which converts BCD to Excess-3 code ?

15. Design a Mod-8 Synchronous counter using JK flipflops.

16. a) Differentiate between Synchronous & Asynchronous sequential circuits.
   b) Design a 3-bit Asynchronous Ripple counter using JK flipflop.

17. Write a short notes on any TWO :
   a) QuineMcClusky tabulation method.
   b) Switching hazards.
   c) Negative peak clamper circuit.
   d) UJT.

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