5E1391

Roll No. _____ Total No of Pages: 2

5E1391

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021
ESC Electronics & Communication Engineering
5EC 3–01 Computer Architecture

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 65

Min. Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Distinguish pipelining from parallelism.

Q.2 How overflow occur in Subtraction?

Q.3 Define Computers Architecture.

Q.4 Differentiate DRAM and SRAM.

Q.5 What is meant by an interleaved memory?

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Is there any difference between RISC & CISC computers? Explain.

Q.2 What is the advantage of pipelining? Explain instruction pipeline in detail.

Q.3 Draw and explain the diagram of a DMA controller.

Q.4 What is need of Virtual Memory in the Computer System?

Q.5 Describe the procedure for addition and subtraction for fixed point number. Explain by use of flowchart.

Q.6 Explain various instruction formats.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[1×15=15]**

Attempt any one questions

Q.1 An address space is specified by 24 bits and the corresponding memory space by 16 bits –

(i) How many words are there in the address space?

(ii) How many words are there in the memory space?

(iii) If a page consists of 2K words, how many pages and block are there in the system?

Q.2 Explain the following terms with reference to Non – Von – Neumann machines.

(i) SISD

(ii) SIMD

(iii) MISD

(iv) MIMD

Q.3 What do you mean by parallel processing? Write the Flynn's classification of parallel processing.

5E5021

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5E5021

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronic Instrumentation & Control Engineering
5EI1A Signals & Systems
EC, EI

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Consider the impulse response of a discrete LTI system to be [8]

$$h[n] = \frac{1}{3} \quad ; \quad 0 \leq n \leq 4$$
$$= 0 \quad , \quad \text{otherwise}$$

Find an expression that relates an arbitrary input x[n] to the output y[n].

(b) Describe the properties of systems (LTI). [8]

OR

Q.1 For input x (t) and output y (t), determine which of the systems are linear and which are nonlinear.

(a) $\frac{dy(t)}{dt} + 3y(t) + u = x(t)$ [4]

(b) $\frac{dy(t)}{dt} + 3y(t) = x(t)$ [4]

(c) $\frac{d^2y(t)}{dt^2} + 2y(t) = x(t)$ [4]

(d) $\frac{dy(t)}{dt} + 2y(t) = x^2(t)$ [4]

UNIT- II

Q.2 (a) State and prove the time shifting and time reversal properties of continuous time Fourier series. [8]

(b) Obtain the time domain periodic signal x [n], given x (k) as : [8]

$$x[k] = \cos\left(\frac{6\pi}{17}k\right)$$

OR

Q.2 (a) Find the average power of signal $x(t) = 2 + 2\cos ut$. [8]

(b) State and prove the Parseval's relation for continuous or discrete periodic signals. [8]

UNIT- III

Q.3 (a) Determine the discrete-time Fourier transform of the periodic impulse train - [8]

$$x(n) = \sum_{k=-\infty}^{\infty} \delta(n - kN)$$

Derive the expression used.

(b) State and prove the multiplication property of the discrete time Fourier transform. [8]

OR

Q.3 (a) Find the FT of the signal $x(t) = e^{-at}\cos\omega_0 t.\, u(t)$ [8]

(b) Find the FT of the unit step function [8]

$$x(t) = \begin{cases} 1 & , \quad t \geq 0 \\ 0 & , \quad t < 0 \end{cases}$$

UNIT- IV

Q.4 (a) Give the properties of Laplace transform. [8]

(b) The system function of causal LTI system is- $H(s) = \frac{s+1}{s^2+2s+2}$. Determine and sketch the response y(t); when the input is $x(t) = e^{-|t|}$, $-\infty < t < \infty$. [8]

OR

Q.4 (a) Find the z – transform and ROC of the signal: $x(n) = \{4(3)^n - 3(5)^n\}u(n)$. [8]

(b) Find the Inverse Laplace transform of - $x(s) = \frac{9s+10}{s(s+2)}$. [8]

UNIT- V

Q.5 (a) Describe in detail in sampling theorem. [8]

(b) Let x (n) = {3, 4, 5, 6} [8]

(i) Find y (n) = x (2n/3) assuming step interpolation where needed.

OR

Q.5 (a) A continuous-time signal consisting of frequency 500Hz and its third harmonic is sampled at the Nyquist rate of sampling. Find the corresponding discrete time signal. [8]

(b) Write short notes on - [8]

(i) Sampling in discrete time signals

(ii) Aliasing

5E5022

-Roll No. _____ Total No of Pages: 2

5E5022

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronics & Communication Engineering
5EC2A Linear Integrated Circuits
EC, EI

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 Draw the AC equivalent of common emitter differential amplifier in-

(a) Differential mode and [8]

(b) Common mode [8]

OR

Q.1 Design an inventing op-amp for given o/p as-

(a) V_{out} = -5 Volt when I/P = 0.02 Volt [8]

(b) V_{out} = -1.5 Volt when I/P = 8 Volt [8]

UNIT- II

Q.2 Draw Op-Amp for-

(a) Voltage to frequency converter and vice versa [8]

(b) Op-Amp as Half wave rectifier [8]

OR

Q.2 Design a square wave generator using Op-Amp for clock frequency= 500Hz. [16]

UNIT- III

Q.3 Find the frequency response of Op-Amp circuit shown in Fig 3. [16]

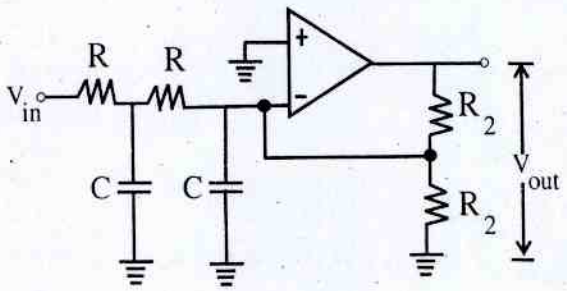

Figure 3

OR

Q.3 Draw Op-Amp circuit for band pass filter and find its transfer function. [16]

UNIT- IV

Q.4 Draw the o/p wave form of a zero crossing detector when I/P = 5 + 15 sinωt [16]

OR

Q.4 Explain the circuit of Astable Multivibrator using Time IC-555. [16]

UNIT- V

Q.5 Explain any two- [8+8=16]

(a) FSK Modulator

(b) Lock and capture range of PLL

(c) FM detector

(d) Log Amplifier

5E1392

Roll No. _____ Total No of Pages: 3

5E1392

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Electronics & Communication Engineering

5EC 4–02 Electromagnetics Waves

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Distinguish between a travelling wave and a standing wave.

Q.2 What do you mean by a stub matching?

Q.3 Define input impedance of a transmission line having both incident and reflected waves.

Q.4 Define scalar and vector fields with examples.

Q.5 Write the differential surface vector in rectangular, cylindrical and spherical coordinates in terms of the components.

Q.6 Write the unit of Poynting vector.

Q.7 Why the displacement current is zero in a perfect conductor and the conduction current is zero in a perfect dielectric?

Q.8 Why is the electric field described by E_{xo} cos ($\omega t - \beta z$) called a uniform plane wave?

Q.9 The TEM mode not supported by waveguide. Why?

Q.10 Draw the field lines of TE_{12} and TM_{02} modes.

PART – B

(Analytical/Problem solving questions) **[4×8=32]**

Attempt any four questions

Q.1 A two – conductor transmission line is excited by a 50 MHz source. The inductance and capacitance per meter length of the line are 300nH and 120pF. Calculate the characteristic impedance (z_o) of the transmission line. Also calculate phase constant, phase velocity and wavelength of the voltage wave.

Q.2 Write the four Maxwell's equations in differential and integral forms.

Q.3 An electromagnetic wave is propagating along +y direction. The electric field associated with it has only – z components. Find the components of the associated magnetic field.

Q.4 Describe the all-electric field components of rectangular waveguide.

Q.5 Define Transverse Electric waves, Transverse magnetic waves and Transverse Electromagnetic waves.

Q.6 Distinguish between near and far fields of a Hertzian dipole. State their properties.

Q.7 State the radiation properties of an isotropic radiator.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 The parallel branches of a two – wire transmission line are terminated in 100Ω and 200Ω. The characteristic impedance of the line is 50 Ω and each section has a length of $\lambda/4$. Find the voltage reflection co-efficient at the input.

Q.2 A uniform plane wave propagates along +z direction in free space. The electric field intensity in the wave has components both in x and y directions. The amplitude of the field in x-direction is 250 V/m and along y direction the amplitude is 300 V/m. The frequency of the wave is 50 MHz. Obtain the phasor expressions of electric and magnetic field intensities.

Q.3 The height and width of a hollow rectangular waveguide with perfect conducting walls are a = 5 cm and b = 3 cm, respectively. Find the operating frequency if its value is midway between the cut – off frequencies of TM_{11} and TM_{21} modes.

Q.4 Derive the Friis transmission formula in terms of the directivities of the receiving and transmitting antennas.

Q.5 What is the order of Laplace's and Poisson's equations? Write the Laplace's equation for the electro static potential V that is a function of only y and z and that is a function of only r in cylindrical coordinates.

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Roll No. _____ Total No of Pages: 4

5E1393

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Electronics & Communication Engineering

5EC 4–03 Control System

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of seven questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Explain Digital control system. [2]

Q.2 Write difference between transient and steady state response. [2]

Q.3 What is Tachogenerator? [2]

Q.4 Define Insensitivity and Robustness. [2]

Q.5 Define lead compensation. [2]

Q.6 Define state, state variable. [2]

Q.7 Define Phase margin and Gain margin. [2]

Q.8 Explain the multivariable control system. [2]

Q.9 Define relative stability. [2]

Q.10 Explain PID controller. [2]

PART – B

(Analytical/Problem solving questions) **[4×8=32]**

Attempt any four questions

Q.1 Define the open loop and closed loop systems. Draw the block diagram representation of open loop & closed loop system by assuming suitable example. Compare the advantages & disadvantages. [8]

Q.2 How an armature controlled DC motor is used in control system applications? Give a schematic diagram, derive the transfer function and draw a block for the system. [8]

Q.3 The block diagram of a simple servo system shown in given fig 1. Find - [1×8=8]

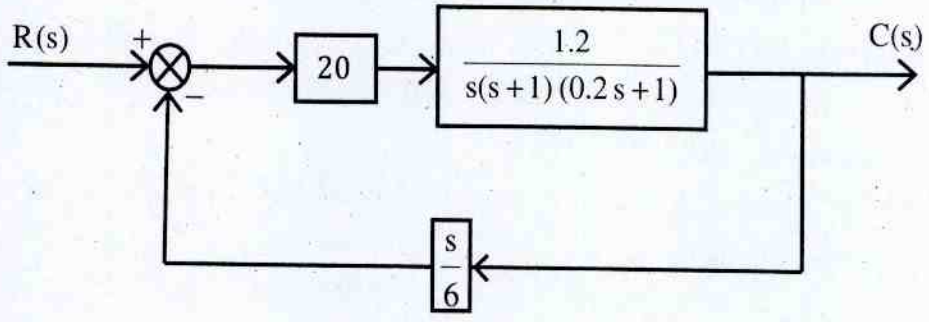

Fig.1

(a) The characteristics equation of the system

(b) Undamped frequency of oscillations

(c) Damped frequency of oscillations

(d) Damping Ratio

(e) Damping factor

(f) Maximum overshoot

(g) First undershoot

(h) Settling time

Q.4 With the help of Routh – Hurwitz criterion, comment upon the stability of the system having the following characteristic equation - [8]

$$s^6 + s^5 + 8\,s^4 + 6\,s^3 + 20\,s^2 + 8\,s + 10 = 0$$

Q.5 Using Nyquist criterion find out whether the system given below is stable –

$$G(s)\,H(s) = \frac{1}{(1+s)^2}$$

Q.6 Write short notes on –

(a) Optimal control system [4]

(b) Nonlinear control system [4]

Q.7 Diagonalize the system whose state model is given below. [8]

$$\dot{x} = \begin{bmatrix} 3 & 4 \\ 2 & 1 \end{bmatrix} x + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$$

and $y = [8 \quad 1]x$

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 For the feedback control system shown in the fig.2 – [3×5=15]

(a) Find $\frac{C}{R}$ using block diagram reduction method

(b) Find $\frac{C}{R}$ using Mason's gain formula

(c) If $G_1 = 10$, $G_2 = 5$, $G_3 = 8$, $H_1 = 1$, $H_2 = 0.25$, $H_3 = 0.2$ and $R = 10.1$, find the input to block G_2.

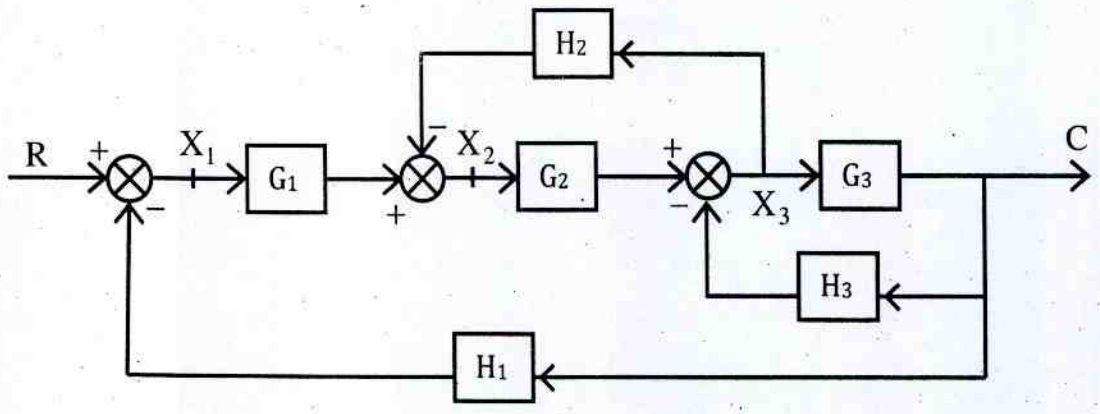

Fig.2

Q.2 Find out the time response of second order system in time domain with a unit step input. [15]

Q.3 The open loop transfer function of a control system is given by – [15]

$$G(s) = \frac{K}{s(s+6)(s^2+4s+13)}$$

Sketch the root locus and determine -

(a) The break-away point

(b) The angle of departure from complex poles

(c) The stability condition

Q.4 The state equation of system are given below. Determine if the system is completely controllable and observable – [15]

$$x = \begin{bmatrix} -6 & 2 & -4 \\ -18 & 3 & -8 \\ -6 & 1 & -3 \end{bmatrix} x + \begin{bmatrix} 1 \\ 3 \\ 1 \end{bmatrix} u$$

$$y = [1 \quad -1 \quad 2]\, x$$

Q.5 Construct the Bode plot on a semi log graph sheet for a unity feedback system whose open loop transfer function is given by – [15]

$$G(s) = \frac{50}{s(1+s)(1+0.5\,s)}$$

5E5023

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5E5023

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronics & Communication Engineering
5EC3A Telecommunication Engineering

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No. 205)*

1. NIL 2. NIL

UNIT- I

Q.1 (a) What are the different types of losses in transmission lines? Explain them. [8]

(b) A 30 km long transmission line operating at 800 MHz has following primary constants - [8]

$R = 0.8\ \Omega/m$, $L = 280$ nH/m, $C = 120$ pf/m,

$G = 10^6$ S/m. All constants are assumed to be independent of frequency.

Calculate –

(i) Characteristic impendence

(ii) Attenuation coefficient (α)

(iii) Phase constant (β)

OR

Q.1 (a) Discuss the different types of transmission lines and their applications. [8]

(b) Establish the differential equation for a transmission line and calculate the voltage and current on line and prove that $Z_o^2 = Z_{oc}.\ Z_{sc}$ [8]

UNIT- II

Q.2 (a) The lossless transmission line operating at 4.5 GHz has L = 3.2μH/m and $Z_o = 95\Omega$. Calculate the phase constant β and phase velocity μ. [8]

(b) Draw a block diagram of a setup for measurement of attenuation and insertion loss of transmission line and explain briefly. [8]

OR

Q.2 (a) What do you mean by matching of transmission line? Explain the method of single and double stub matching with neat diagram. [8]

(b) Derive the relationship between standing wave ratio and reflection co-efficient. [8]

UNIT- III

Q.3 (a) Describe the constant K-filters [8]

(b) Draw a (T) and (π) section of a proto type high pass filter and explain the parameter α and β [8]

OR

Q.3 (a) Design a m-derived T- section low pass filter having cut off frequency $f_c = 1000Hz$, design impedence $R_K = 800\Omega$ and frequency of infinite attenuation $f_\infty = 1200Hz$ [8]

(b) Explain a symmetrical lattice attenuator. Write its design equations in terms of characteristic impedence and attenuation factor. [8]

UNIT- IV

Q.4 (a) Explain the frequency and Time division multiplexing. [8]

(b) Explain the working of two wire and four wire repeaters and compare both of them. [8]

OR

Q.4 (a) Discuss the following – [8]

(i) Traffic unit

(ii) Busy hour

(iii) Grade of service

(b) With the help of neat diagram explain the working of echo cancellers. [8]

UNIT- V

Q.5 (a) Explain EPABX Telephone exchange. [8]

(b) Discuss the supervisory and AC signaling. [8]

OR

Q.5 Write short notes on any two - [2×8=16]

(a) STS and TST switching

(b) Signaling in telephone system

(c) Facsimile services

5E5024

Roll No. _____ Total No of Pages: 2

5E5024

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronics & Communication Engineering
5EC4A Analog Communication

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly.*
Units of quantities used/calculated must be stated clearly.
Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Find the expression for overall noise figure and overall noise temperature of a cascaded amplifier. [10]

(b) Find the r.m.s. value of thermal voltage across a resistor of 1MΩ at a temperature of 27°C, if the measurement is made with an increment having a bandwidth of 10^4 Hz. [6]

OR

Q.1 (a) Define noise and give its classification. Explain the spectral properties of shot noise and thermal noise. What do you mean by flicker noise and partition noise? [12]

(b) Explain the terms: noise bandwidth, noise figure and noise temperature. [4]

UNIT- II

Q.2 (a) Draw and explain the circuit diagram of a linear diode detector and derive and condition for choice of time constant. [8]

(b) Draw a block diagram of Weaver method of SSB-generation and explain. [8]

OR

Q.2 Draw the block diagram of a super-heterodyne receiver and explain the function of each block also gives its merit over TRF receiver. Why is it called super-heterodyne? Why local oscillator frequency kept higher? [16]

UNIT- III

Q.3 (a) Draw and explain the circuit diagram of the following FM modulators -

(i) Using varactor diode [5]

(ii) Reactance tube modulator [5]

(b) Define the FM and PM and derive the expressions for these signals under -

(i) Wideband case [3]

(ii) Narrowband case [3]

OR

Q.3 (a) Draw the schematic diagram of an FM Transmitter and Receiver. [6]

(b) Draw and explain the circuit diagram of the following FM detectors –

(i) PLL detector [5]

(ii) Foster-Seeley discriminators [5]

UNIT- IV

Q.4 Derive the expression for the noise power density at the discriminator output and draw its spectrum. Derive a relation for figure of merit for FM and compare it with figure of merit of AM system. [16]

OR

Q.4 (a) Calculate the figure of merit for DSB and SSB Systems with envelope detector and discuss the threshold effect. [12]

(b) Define the terms Pre-emphasis and De-emphasis with suitable circuits. [4]

UNIT- V

Q.5 (a) Draw the waveforms PWM and PPM and explain the method of generation of PWM and PPM using PLL. [12]

(b) What is Sampling? Discuss the flat top sampling. [4]

OR

Q.5 (a) State the low pass sampling theorem and explain its significance. What is Aliasing and Aperture effect? [12]

(b) Briefly explain TDM-PAM system. [4]

5E1394

Roll No. _____ Total No of Pages: 3

5E1394

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Electronics & Communication Engineering

5EC 4-04 Digital Signal Processing

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of eight questions from Part B and two questions out of five from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 Explain about zero – order hold sampling.

Q.2 Explain the Sampling theorem for band pass signal.

Q.3 Write the advantages of representing the digital filter in the block diagram form.

Q.4 Compare Canonic structure and Non-Canonic structure.

Q.5 Explain Parseval's theorem for Discrete time sequence.

Q.6 Explain the relation between DFT and Z – transform.

Q.7 Explain Picket-Fence effect.

Q.8 Explain the application of DFT in linear filtering and spectrum analysis.

Q.9 Compare FIR filters and IIR filters.

Q.10 What do you mean by linear phase response?

PART – B

(Analytical/Problem solving questions) **[4×8=32]**

Attempt any four questions

Q.1 Find the Nyquist rate for the continuous time signal given below and find x[n]-

$$x(t) = \frac{\sin(4 \times 10^3 \pi t)}{\pi t}$$

Q.2 DFT of a sequence x(n) is given by-

$X(k) = \{6, 0, -2, 0\}$

Determine x(n).

Q.3 Find direct forms – II realizations for the second order filter given by-

$y(n) = 2b\cos\omega_o y(n-1) - b^2 y(n-2) + x(n) - b\cos\omega_o x(n-1)$

Q.4 Find the N – Point DFT of the following sequence-

$$h(n) = \begin{cases} \frac{1}{3} & \text{for } 0 \leq n \leq 2 \\ 0 & \text{elsewhere} \end{cases}$$

Q.5 Show that $z\left(\frac{1}{n+1}\right) = z\log\left(\frac{z}{z+1}\right), n > 0$

Q.6 Write the short notes of design of IIR digital filter.

Q.7 A causal discrete – time LTI system is described by-

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n)$$

Where x(n) and y(n) are the input and output of the system, respectively. Determine the system function H(z) and impulse response h(n) of the system.

Q.8 Explain the concept of multirate signal processing and different application of DSP.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 Determine the 8-Point DFT of the following sequence-

$x[n] = \left\{\frac{1}{2}, \frac{1}{2}, \frac{1}{2}, \frac{1}{2}, 0, 0, 0, 0\right\}$ use in place radix – 2 decimation in time FFT Algorithm.

Q.2 Draw the cascade and parallel realizations for the following system function-

$$H(z) = \frac{1+\frac{1}{4}z^{-1}}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$$

Q.3 Using bilinear transformation, design Butterworth filter which satisfy the following condition-

$$0.8 \leq \left|H/e^{j\omega}\right| \leq 1 \qquad 0 \leq \omega \leq 0.2\,\pi$$

$$\left|H/e^{j\omega}\right| \leq 0.2 \qquad 0.6\,\pi < \omega < \pi$$

Q.4 Compute the 8–point circular convolution for following sequence-

$x_1(n) = \{1, 1, 1, 1, 0, 0, 0, 0\}$

$x_2(n) = \sin\left(\frac{3\,\pi\,n}{8}\right)\ 0 \leq n \leq 7$

Q.5 Determine the impulse response of h(n) for the system described by the second order difference equation-

$y(n) - 4y(n-1) + 4y(n-2) = x(n) - x(n-1)$

Where $y(-1) = y(-2) = 0$

5E1395

Roll No. _____ Total No of Pages: 3

5E1395

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Electronics & Communication Engineering

5EC 4–05 Microwave Theory & Techniques

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 82

Min. Marks: 29

Instructions to Candidates:

Attempt all ten questions from Part A, four questions out of eight questions from Part B and two questions out of seven from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[10×2=20]**

All questions are compulsory

Q.1 If the cutoff frequency of an air-filled waveguide is 20 GHz then what will be its cut off frequency after filling with a dielectric material of relative dielectric constant $\varepsilon_r = 16$?

Q.2 Write S – parameter units.

Q.3 Write two differences between MIC and MMIC.

Q.4 If cutoff frequency of TE_{11} mode is 5 GHz then find the operating frequency of TE_{02} mode.

Q.5 Draw the structure of an E – plane horn.

Q.6 Write the name of one dominant loss in waveguide.

Q.7 Define noise figure of a MW amplifier.

Q.8 Write the name of two MW devices which works on bulk and do not have any semiconductor junction.

Q.9 Why PIN diode speed is more than a normal PN junction? Give only the main reason.

Q.10 Write the name of two MW frequency bands used in military application.

PART – B

(Analytical/Problem solving questions) **[4×8=32]**

Attempt any four questions

Q.1 Draw the structure of a MW BJT (Heterojunction) and explain its model and working.

Q.2 Why TEM mode is not possible inside waveguide, support the reasons with Maxwell's equations. How TE and TM modes are excited in a rectangular waveguide?

Q.3 Explain any one scheme of MW power measurement when the MW power is less than 1 Watt.

Q.4 How differential negative mobility region achieved in MW devices? Draw the two valley diagram of a Gunn diode and explain its working.

Q.5 Draw the electric and magnetic field line distributions/pattern in –

(a) Microstrip line

(b) Co-planar line

Q.6 Design a power divider with matched terminations and operating at 10 GHz.

Q.7 Explain and write the s-parameter of a magic tee when it's all port are matched. What will be the effect on port mismatch and how S-parameter change with it?

Q.8 Draw the electric and magnetic field pattern inside a waveguide at –

(a) TE_{10}

(b) TM_{21}

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[2×15=30]**

Attempt any two questions

Q.1 Find all electric and magnetic fields expression for TM mode inside a rectangular waveguide with the help of Maxwell's equations.

Q.2 If the S-parameter of a two port MW system is $S_{11} = 2 + j1$, $S_{21} = 4 + J1$, $S_{12} = 2+j1$ and $S_{11} = 0.6 + j2$. Find its gain, reflection and transmission constant.

Q.3 Explain the working of two hole directional coupler and design it for f = 5 GHz. Assume the waveguide is filled with $\varepsilon_r = 4$.

Q.4 Explain the impedance measurement technique used in MW system.

Q.5 Define the quality factor of a MW resonator and explain its –

(a) Under coupling

(b) Over coupling

(c) Critical coupling conditions

Q.6 Define EMI and EMC. Draw two scheme for obtain the MW system which is compatible with required EMI/EMC.

Q.7 How Klystron works? Draw the structure of a two cavity Klystron and explain the bunching phenomena in it.

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Roll No. _____ Total No. of Pages: 2

5E5025

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronics & Communication Engineering
5EC5A Microwave Engineering - I

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Derive the field equations in rectangular waveguides in the TE_{mn} mode. [10]

(b) Derive the average power transmitted through a circular guide in TE_{np} modes. [6]

OR

Q.1 (a) Draw the field patterns for stripline and microstrip lines. [6]

(b) A certain microstrip line has the following parameters –
$\varepsilon_r = 3.2$, h = 0.762 mm, t = 71.12 micrometer, w = 4.5 mm. [6]

(c) Write down the advantages of coplanar lines over waveguides. [4]

UNIT- II

Q.2 (a) Write down the impedance, admittance and scattering matrices for two port network. [6]

(b) A two port network is known to have the following scattering matrix –

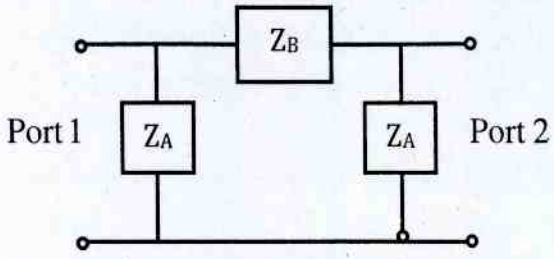
$$[S] = \begin{bmatrix} 0.15 \angle 0° & 0.85 \angle -45° \\ 0.85 \angle 45° & 0.2 \angle 0° \end{bmatrix}$$

Determine if the network is reciprocal and lossless. If port 2 is terminated with a matched load, what is the return loss seen at port 1? If port 2 is terminated with a short circuit, what is the return loss seen at port 1? [10]

OR

Q.2 (a) Derive expressions that give the impedance parameters in terms of the ABCD parameters. [8]

(b) Derive the [z] matrices for the two – port network shown below. [8]



UNIT- III

Q.3 (a) Explain the operation of H – plane, E – plane and E – H plane junctions. Why a hybrid E – H plane Tee referred to a magic tee? Derive the scattering matrix of Magic Tee. [10]

(b) What is the purpose of directional couplers? Explain the operation of a 4 port directional coupler. [6]

OR

Q.3 (a) Draw the structures of ring resonator, Wilkinson power divider, low pass and band pass filter using microstrip line. [8]

(b) Design a Wilkinson power divider with a power division ratio of $P_3/P_2 = 1/3$ and a source impedance of 50Ω. [8]

UNIT- IV

Q.4 (a) Describe the methods of microwave power measurement. [8]

(b) Describe the method of impedance measurements. [8]

OR

Q.4 (a) Write short notes on noise figure meter. [8]

(b) In an SWR measurement at 10 GHz the distance between the successive minima is 0.1 cm. Inside dimensions of waveguides are 4 cm and 2 cm respectively. TE_{10} mode is propagating through the waveguide. Calculate the VSWR. [8]

UNIT- V

Q.5 (a) Write down the name of different substrates used for microwave integrated circuits and their properties. [8]

(b) Describe the photolithographic process using diagrams. [8]

OR

Q.5 (a) List the basic material for MMICs. What are the basic characteristics required for an ideal substrate material for MMICs. [8]

(b) Describe the MMIC techniques and explain the basic fabrication processes for MOSFETs. [8]

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5E1398

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021

PCC/PEC Electronics & Communication Engineering

5EC 5–14 Satellite Communication

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 65

Min. Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 Why noise temperature an important parameter in communication receivers? [2]

Q.2 List the earth station parameters affecting the C/N ratio. [2]

Q.3 What are the main functions of TTC subsystem? [2]

Q.4 What is FDMA? [2]

Q.5 Give advantages of satellites. [2]

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 Distinguish between TDMA, FDMA and CDMA techniques. [10]

Q.2 Explain with a suitable diagram, the attitude and orbit control system present in the space segment. [10]

Q.3 With a neat sketch, explain the power budget for a satellite link considering back off and rain fade margin. [10]

Q.4 How does the system noise temperature affect the performance? Derive the expression for overall system noise temperature at the receiving earth station. [10]

Q.5 State the Kepler's law. Discuss its importance in satellite communications, also give advantages of disadvantages of satellite communication. [10]

Q.6 (a) Explain the following – [5]

(i) Input back-off

(ii) Output back-off

(iii) C/N ratio

(b) For a satellite circuit the individual link C/N spectral density ratios are uplink 100 dB Hz; downlink : 87 dB Hz. Calculate the combined C/No ratio. [5]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[1×15=15]**

Attempt any one questions

Q.1 (a) Explain the pre – assigned FDMA with neat diagram. [7]

(b) With aid of diagram explain demand assigned FDMA. [8]

Q.2 (a) A satellite is moving in highly eccentric Molniya orbit having the farthest and the closest points as 3500 km and 500 km and 500 km respectively, from the earth surface. Determine the orbital time period and the velocity at apogee and perigee points. [8]

(b) The semi – major axis and the semi minor axis of an elliptical satellite orbit are 20,000 km and 16,000 km respectively. Determine the apogee and perigee distances. [7]

Q.3 How does the system noise temperature effects the performance? Derive the expression for overall system noise temperature at the receiving earth station. [15]

5E5026

Roll No. _____ Total No. of Pages: 3

5E5026

B. Tech. V - Sem. (Back) Exam., Feb.-March - 2021
Electronics & Communication Engineering
5EC6.1A Biomedical Instrumentation

Time: 2 Hours **Maximum Marks: 48**
Min. Passing Marks: 15

Instructions to Candidates:

*Attempt **three questions,** selecting **one question each** from any three **unit.** All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

UNIT- I

Q.1 (a) Explain how bio-electric potential is generated. Define resting and action potentials with neat diagrams. Also include explanation about refractory periods. [8]

(b) Explain various elements of central nervous system with a suitable diagram. [8]

OR

Q.1 (a) Describe the working of human blood circulation system with schematic diagram. [8]

(b) Explain in detail the electrodes used for ECG measurements with suitable diagrams. [8]

UNIT- II

Q.2 (a) Draw an ECG of normal person, labeling the critical features and explain the working of an ECG machine. [10]

(b) Give the characteristic of different heart sounds during phonocardiography. [6]

OR

Q.2 (a) Design and explain the 10-20 electrode system used in EEG. [8]

(b) Define blood pressure. Describe any indirect blood pressure measurement method in detail. [8]

UNIT- III

Q.3 (a) Describe principle for computerized axial tomography and compare it with conventional X-Ray imaging system. [8]

(b) Write short note on –

(i) Endoscopy [4]

(ii) Ultrasonography [4]

OR

Q.3 (a) Explain the working principle for measurement of partial pressure of oxygen and carbon dioxide in blood. [8]

(b) Write short note on -

(i) ESR measurement [4]

(ii) GSR measurement [4]

UNIT- IV

Q.4 (a) Explain a basic bio-telemetry system with suitable diagram along with its advantages and disadvantages. [8]

(b) With the help of block diagram of ventilator along with its accessories, explain its functioning. [8]

OR

Q.4 (a) Elaborate on the medical equipment maintenance and safety parameters in handling it. [8]

(b) What is pacemaker? Explain the functioning of synchronous pacemakers. [8]

UNIT- V

Q.5 (a) Explain the various abnormalities observed in ECG patterns. [8]

(b) Write short note on clinical applications of –

(i) EEG [4]

(ii) EMG bio-potentials [4]

OR

Q.5 (a) Explain the data acquisition and processing system for patient monitoring. [8]

(b) Write short note –

(i) Atrial abnormalities [4]

(ii) Ventricular abnormalities [4]

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Roll No. _____ Total No of Pages: 2

5E1396

B. Tech. V - Sem. (Main / Back) Exam., Feb.-March - 2021
PCC/PEC Electronics & Communication Engineering
5EC 5–11 Bio-Medical Electronics

Time: 2 Hours **[To be converted as per scheme]**

Max. Marks: 65

Min. Marks: 23

Instructions to Candidates:

Attempt all five questions from Part A, four questions out of six questions from Part B and one questions out of three from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used /calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. NIL 2. NIL

PART – A

(Answer should be given up to 25 words only) **[5×2=10]**

All questions are compulsory

Q.1 What is ECG? Draw its waveform. [2]

Q.2 What is Radio Pill? [2]

Q.3 What do you mean by "Plethysmography"? [2]

Q.4 What is the use of bioamplifier? [2]

Q.5 Explain about pH electrodes. [2]

PART – B

(Analytical/Problem solving questions) **[4×10=40]**

Attempt any four questions

Q.1 What is need for telemetry in Biomedical Instrumentation? [10]

Q.2 What is the function of defibrillator? Draw and explain the working principle of dc defibrillator. [10]

Q.3 Explain Respiratory system of a human body with a neat diagram. [10]

Q.4 Describe blood pressure measurement by direct and indirect measurement method. [10]

Q.5 Explain the transmission modes of ultrasound in detail. [10]

Q.6 What is the principle behind NMR imaging? What are advantages of NMR imaging? [10]

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) **[1×15=15]**

Attempt any one questions

Q.1 List any four properties of X-Ray. With a neat block diagram, explain the working of X – Ray machine. [15]

Q.2 Explain the working of Heart – Lung Machine (HLM), and state its application. Justify the scenarios where HLM can be used. [15]

Q.3 Design a suitable amplifier that can be used in the front end of an ECG machine. Justify your answer by specifying the features of the selected amplifier. [15]
