5E1781

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5E1781

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Electronics and Communication Engineering
5EC4-02 Electromagnetics Waves

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

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).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Justify that a magnetic field is a solenoid in nature.
2. What is divergence theorem?
3. Define the reflection coefficient and VSWR.
4. What is the order of Laplace's and Poisson equations?
5. What is difference between electric dipole and magnetic dipole?
6. Find the EM Wave velocity in medium in which $\varepsilon_r = 9$.
7. What is pointing vector? Explain and derive its expression.
8. What is meant by scalar and vector fields?
9. Define displacement current density.
10. What is stub?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. What is Smith Chart? How it can be used to determine load impedance and input impedance of a terminated line?

2. Ampere's magnetic circuit law cannot be used to find the field intensity of line current of finite length. Explain why?
3. Change the vector $A = 10i + y^2z\,j$ in cylindrical coordinating system.
4. How quarter-wave transmission (QWT) line acts as an impedance transformer?
5. If an electric field $E = 2i + 24\,j$ is incident at $x = 0$ from one medium $\varepsilon_{r1} = 4$ to second medium $\varepsilon_{r2} = 9$ then find the electric field in the second medium.
6. What is boundary condition? Develop relation between normal and tangential electric field at the interface of two media.
7. An inductive reactance of $j25\Omega$ is to be realized by using a short circuited transmission line of characteristic impedance of 50Ω operating at 1GHz. Find out the minimum length of short circuited line (in cm).

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. A good conductor is located in a static electric field. Why.
   a) No field exists inside a conductor?
   b) Charges are only on its surface?
   c) Potential on its surface is same everywhere?
2. Find all electric and magnetic fields expression for TE mode inside a rectangular waveguide with the help of Maxwell's equations.
3. Find the total electric field at a point (0, 0, 2) due to two charges of equal in magnitude (10C) and opposite in nature which are placed at the point (0, -2, 2) and (4, 0, 2), respectively.
4. Define the following terms:
   a) Wave Impedance,
   b) Energy Density,
   c) Ampere's Law and
   d) Conservative Field.
5. Write the differential and integral form of all four Maxwell's equations in lossy medium.

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5E1782

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Electronics and Communication Engineering
5EC4-03 Control System

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

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).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Draw the polar plot for function, $G(s)=\frac{1}{s^3(s+1)}.H(s)=1$
2. Define stability for a linear time invariant system.
3. Differentiate closed loop and open loop control system.
4. What is the value of gain K at any given point on the root locus?
5. Explain Nyquist Stability criterion.
6. What do you mean by Non-linear system? Explain.
7. Write down the merits and demerits of phase lag-lead compensation.
8. Draw and explain LVDT.
9. In own word, explain transient accuracy in control system.
10. An automatic washing machine is which type loop system? Explain it.

PART - B

(Analytical/Problem Solving Questions)

(5×4=20)

Attempt any Five questions.

1. Sketch the polar plot for $G(s)=\frac{1}{s(s+1)}$

2. Construct the Nyquist plot for a unity feedback control system whose open loop transfer function is $G(s)\cdot H(s)=\frac{k}{s(s^2+2s+2)}$

   Find, the maximum value of k for which the system is stable.

3. Consider a feedback control system with loop transfer function,

   $G(s)\cdot H(s)=\frac{k(1+0.5s)}{s(1+s)(1+2s)}$. Find, which type of closed loop system and why?

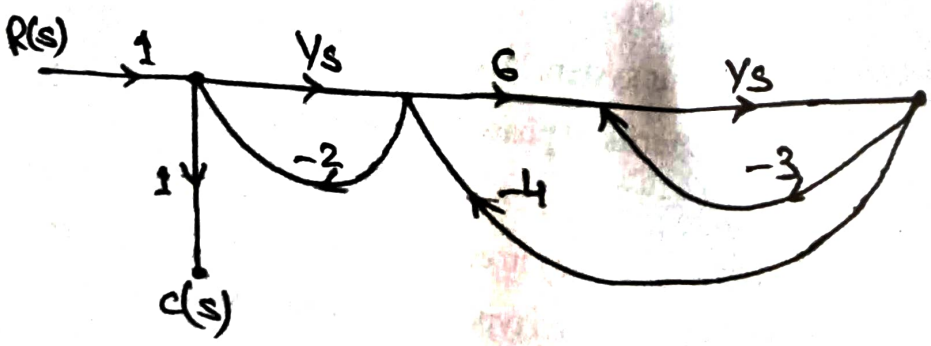
4. Consider a system described by the following difference equation,

   $y(n+3)+6y(n+2)+11y(n+1)+6y(n)=r(n+2)+9r(n+1)+20r(n)$, where y is output and r is input. Find the transfer function of system.

5. The Bode plot of the system is $G(s)=\frac{10}{0.66s^2+2.33s+1}$. Find its corner frequencies.

6. Explain the affect when a tachometer is added to a servomechanism.

7. The signal flow graph of a system shown below,



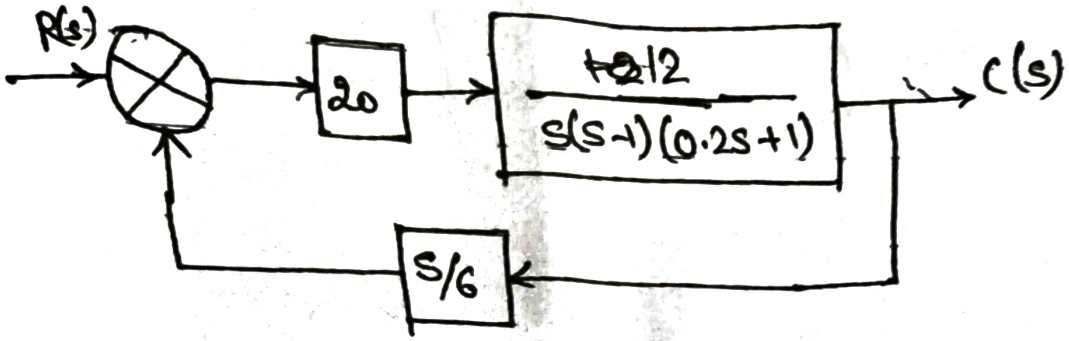
Find the transfer function of given system.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. The block diagram of a simple servo system is



Find:

a) The characteristics equation of system,

b) Damped and undamped frequency of oscillation,

c) Damping ratio,

d) Maximum overshoot,

e) Settling time.

2. Write a short note on:

a) Optimal control system,

b) Non-linear control system.

3. A certain feedback control system is described by $G(s)=\frac{k}{s^2(s+20)(s+30)}$, $H(s)=1$.

a) Determine steady state error coefficients.

b) Also determine the value of k to limit the steady state error to 10 units due to input $r(t)=1+10t+20t^2$. **(5+5)**

4. Explain lead compensator design using Bode Plot.

5. A unit feedback system is described by $G(s)\cdot H(s)=\frac{10}{s(1+0.2s)(1+0.01s)}$.

Construct a Bode plot and find,

a) Gain and Phase crossover frequency,

b) Gain and Phase margin,

c) Stability of closed loop system.

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5E1783

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5E1783

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Electronics and Communication Engineering
5EC4-04 Digital Signal Processing

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

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).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Define discrete-time signal and give one example.
2. State any two properties of Z-Transform.
3. What is aliasing in signal sampling?
4. Write the relationship between linear convolution and circular convolution.
5. Define Discrete Fourier Transform (DFT).
6. What is meant by spectral estimation?
7. Mention two applications of multirate signal processing.
8. Define the Radix-2 FFT algorithm.
9. What is the need of FFT over DFT?
10. State the effect of finite register length in digital filters.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Derive the condition for stability of a discrete-time signal using Z-Transform.

[Contd....

2. Compute the 4-point DFT of the sequence $x(n) = \{1, 2, 3, 4\}$.
3. Compare Butterworth and Chebyshev filters in terms of characteristics and applications.
4. Discuss the application of DSP in speech and image processing.
5. Differentiate between low-pass, band-pass and high-pass digital filters with sketches.
6. Explain the effect of finite word length on digital filter performance.
7. Explain FIR filters design using the Park-McClellan algorithm.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. A discrete-time signal is given by $x[n] = 2^n \mu(n)$.
   a) Find its Z-Transform and region of convergence.
   b) Using the inverse Z-Transform, reconstruct $x[n]$.
2. Design a digital low-pass FIR filters using Hamming Window with cut off frequency 1 KHz and sampling frequency 8 KHz, filter length N = 21.
3. Discuss the effects of finite register length on FIR and IIR filters with suitable numerical example. Suggest ways to minimize the effect.
4. Explain multirate signal processing and describe its application in modern DSP system like sub-band coding or audio compression.
5. A signal is processed using fixed point arithmetic system with 8-bit word length.
   a) Calculate the Quantization error introduced.
   b) Discuss its impact on FIR filter output.

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5E1784

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Electronics and Communication Engineering
5EC4-05 Microwave Theory and Techniques

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

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).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. What are the advantages of microwaves?
2. Define the reflection coefficient and standing wave ratio.
3. Draw the field lines for TE_{10} and TE_{11} modes of a rectangular waveguide.
4. Define the S-parameters and its properties.
5. Draw the symbol of a circulator and its application.
6. What is transit time, and what are its implications?
7. What are BARITT diodes?
8. Write the advantages of tropospheric scatter.
9. What affects radar range and resolution?
10. What is transponder? How many transponders are used on a typical satellite?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Write down the concept of mode and feature of TEM, TE and TM modes.

2. Derive expression for the fields in rectangular waveguides in case of Transverse Magnetic (TM) wave Hz = 0.
3. Derive the S-matrix of an ideal Magic Tee.
4. What are the salient features of TWT? How it is able to give large bandwidth?
5. Explain the function of the PIN diodes and Varactor diodes.
6. Describe the measurement of frequency by slotted line method.
7. What is the basic function of the communication satellite? Why is it needed? Why are the uplink and down link frequencies different?

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. A rectangular waveguide has a cross-sectional area of 2.29×1.45 cm^2, and the operating frequency is 104 Hz. Calculate the following:
   a) free space wavelength,
   b) cut-off wavelength,
   c) guided wavelength,
   d) phase velocity in the guide,
   e) wave impedance of the waveguide.
2. What is directional coupler? Describe various performance parameters of coupler. Derive the S-matrix of an ideal directional coupler.
3. What is magnetron? Mention different types of magnetrons and describe the travelling wave magnetron.
4. Design a maximally flat low-pass filter with a cut off frequency of 2 GHz, impedance of 50Ω, and at least 15 dB insertion loss at 3GHz.
5. Write notes on following:
   a) Microwave Antennas.
   b) Radar.
   c) EMI and EMC.
   d) Monolithic Microwave ICs.
   e) RFMEMS for microwave components.

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5E1785

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Electronic & Communication Engg.
5EC5-11 Bio-Medical Electronics (Elective - I)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

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)

PART - A

(Answer should be given up to 25 words only)

All questions are Compulsory. **(10×2=20)**

1. Define the scope of biomedical electronics.
2. What are biomedical transducers? Give two examples.
3. Differentiate between displacement and velocity transducers.
4. Mention any parameter measured using Laser Sensors.
5. What are dissolved ions and why are they important in physiology?
6. What is the function of a bio-electrode?
7. Mention any two differences between ECG and EEG signals.
8. What is impedance plethysmography used for?
9. Name any two imaging techniques used in biomedical applications.
10. List any two safety concerns in biomedical instrumentation.

Roll No. 1769

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Explain the working principle of a temperature transducer used in biomedical systems.
2. Describe the structure and function of biopotential amplifiers.
3. How are pacemakers designed to adapt to changing heart rates?
4. Explain ultrasonic imaging with the help of a neat diagram.
5. Compare and contrast X-ray and nuclear imaging techniques.
6. Explain the working of a heart-lung machine and its significance in surgery.
7. Discuss the physiological changes detectable through pressure sensors.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. **(3×10=30)**

1. Describe various biomedical transducers used to measure displacement, force, acceleration, and flow. Support your answer with block diagrams.
2. Explain different types of bio-electrodes. Discuss their application in ECG, EMG, and EEG measurements with suitable diagrams.
3. Write a detailed note on prosthetic devices and biomedical aids like defibrillators, artificial kidney, and aids for the handicapped.
4. Explain impedance plethysmography with circuit diagram. Discuss its applications and limitations.
5. Discuss the hazardous effects of electric shock. What is more dangerous Voltage or Current, discuss briefly.

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5E1786

B.Tech. V-Sem. (Main & Back) Examination, November/December - 2025
Electronics and Communication Engineering
5EC5-12 Embedded Systems (Elective - I)

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of five questions from Part C.

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).

PART - A

(Answer should be given up to 25 words only)

All questions are Compulsory. **(10×2=20)**

1. What is an embedded system?
2. Give two examples of embedded systems.
3. What are embedded microcontroller cores?
4. Mention two types of embedded memories.
5. Define signal conditioning.
6. What is real-time programming?
7. What is the role of digital signal processing in embedded systems?
8. What is the difference between volatile and non-volatile memory in embedded systems?
9. Name any two real-time operating systems (RTOS).
10. What are the thermal considerations in embedded system design?

PART - B

(Analytical/Problem Solving Questions)

Attempt any Five questions. **(5×4=20)**

1. Explain the concept of embedded systems design and its objectives.
2. Discuss various technological aspects involved in embedded systems.
3. Describe design trade-offs in embedded systems with examples.
4. Explain the software aspects of embedded systems.
5. Explain subsystem interfacing and why is it important?
6. Explain process compatibility in embedded system design.
7. Discuss the role of real-time programming languages in embedded systems.

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any Three questions. **(3×10=30)**

1. Explain various types of memories used in embedded systems.
2. Describe the architecture and advantages of embedded microcontroller cores.
3. Explain user interfacing in embedded systems with examples.
4. Explain interfacing between analog and digital blocks in embedded systems.
5. What are the key challenges in embedded system design? Explain.