



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	: B.Tech VI Semester Supplementary Examinations Nov/Dec-2025		
Course Name	: Microwave and Optical Communications		
Course Code	: A404315		
Branch	: Electronics & Communication Engineering		
Date & Session	: 09-12-2025 AN	Duration: 3 hours	Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | |
|--|-----|
| 1. Define velocity Modulation. | 1 M |
| 2. Differentiate O-type and M-type microwave tubes. | 1 M |
| 3. Name any two applications of microwave solid-state devices. | 1 M |
| 4. Mention any two differences between IMPATT and TRAPATT devices. | 1 M |
| 5. Differentiate between E-plane and H-plane tees. | 1 M |
| 6. What is post? What are the applications? | 1 M |
| 7. Write the properties of scattering matrix. | 1 M |
| 8. What type of error occurs while measuring microwave parameters? | 1 M |
| 9. List any two types of optical fiber configurations. | 1 M |
| 10. What are WDM concepts in optical communication? | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | |
|--|-----|
| 11.A). Explain the electron bunching process in Reflex Klystron with neat apple-gate diagram and derive the equation for its power efficiency. | 10M |
|--|-----|

OR

- | | |
|--|-----|
| 11. B). Examine the operation of TWT with neat diagrams. | 10M |
| 12. A). Why pi-mode operation is preferred in cylindrical type magnetron? Give its working principle with neat sketches. | 10M |

OR

- | | |
|---|-----|
| 12. B). i) Classify microwave solid state devices. | 5M |
| ii) Explain the operation of Gunn diode with diagrams. | 5M |
| 13. A). What is phase shifter? Describe its principle of operation with a neat sketch. Give its applications. | 10M |

OR

- | | |
|---|-----|
| 13. B). What are the different waveguide attenuators? Explain them in detail. | 10M |
| 14. A). Derive the Scattering matrix of a Magic Tee and justify its applications. | 10M |

OR

- | | |
|---|-----|
| 14. B). Discuss the following microwave impedance measurement techniques:
i) Using Slotted line ii) Using Reflectometer. | 10M |
| 15. A). Define an optical fiber. Explain in detail different types of optical fibers with neat sketches. | 10M |

OR

- | | |
|---|-----|
| 15. B). Describe the process of light propagation in an optical fiber with the help of a ray diagram. | 10M |
|---|-----|

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech VI Semester Supplementary Examinations Nov/Dec-2025
 Course Name : Control Systems
 Course Code : A404316
 Branch : Electronics & Communication Engineering
 Date & Session : 10-12-2025 AN Duration: 3 hours Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions
Each question carries ONE mark.

10x1=10M

1. Write the difference between open-loop and closed-loop control systems. 1 M
2. Write any two rules of block diagram algebra. 1 M
3. What are the time domain specifications used to analyze the step response of a second-order system? 1 M
4. What is an order of a system? Determine the order of a system given the transfer function: 1 M

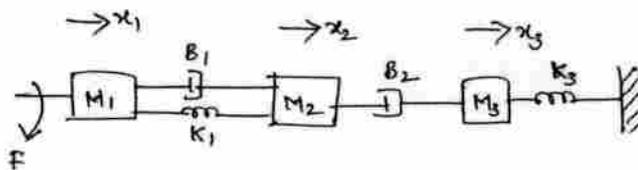
$$\frac{Y(s)}{U(s)} = \frac{5}{s^3 + 4s^2 + 3s + 2}$$
5. What is gain margin in control systems? 1 M
6. State Nyquist stability criterion. 1 M
7. Outline the advantages and disadvantages of using PID controllers in control systems. 1 M
8. How do lead and lag compensators differ. 1 M
9. What do the terms state, state variables in a control system? 1 M
10. Identify the condition required for a system to be controllable. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

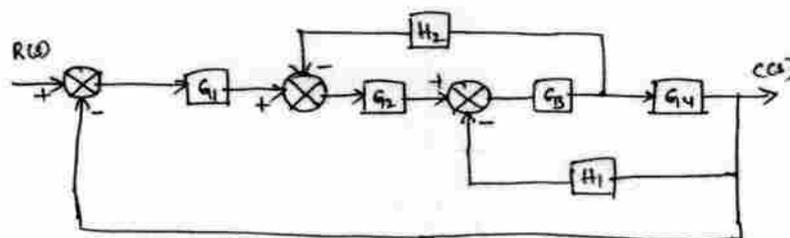
5x10=50M

- 11.A). Write the differential equations governing the Mechanical rotational system shown in Figure. 10M



OR

11. B). Determine the overall transfer function C(S)/R(S) for the system shown in Figure. 10M



(P.T.O..)

12. A). For a unity feedback system $G(s) = \frac{36}{s(s+0.72)}$ determine characteristic equation. Also, calculate damping ratio, peak time, settling time, and peak overshoot. 10M

OR

12. B). A unity feed back system is characterized by the open loop transfer function 10M

$$G(s) = \frac{K}{S(S+2)(S+4)}$$

Using Root locus

- i) Calculate the range of values of K for the system to be stable
ii) What is the marginal value of K for stability?

13. A). Obtain the polar plot for the open loop transfer function. 10M

$$G(s) = \frac{K}{S(S+2)(S+10)}$$

OR

13. B). Obtain the Bode plot of $G(s) = \frac{5}{s(s+1)(s+15)}$ 10M

14. A). Explain the effect of Proportional Integral control action on the performance of a second order system. 10M

OR

14. B). Design a suitable lag-lead compensator for a unity feedback system whose open loop transfer function is given as 10M

$$G(s) = \frac{0.025}{s(1+0.5s)(1+0.05s)}$$

to achieve static error constant as 10 seconds, phase margin as 50° , and gain margin as ≥ 10 dB.

15. A). $A = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ $C = [1 \ 2]$ are matrices representing a state model. Check controllability and observability of the system. 10M

OR

15. B). A linear system is given by 10M

$$\dot{X} = \begin{bmatrix} -3 & 1 \\ -2 & 0 \end{bmatrix} X + \begin{bmatrix} 0 \\ 1 \end{bmatrix} U, \quad Y = [1 \ 0] X, \quad X(0) = \begin{bmatrix} 1 \\ -1 \end{bmatrix}.$$

Find the response of system for unit impulse input.

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech VI Semester Supplementary Examinations Nov/Dec-2025
Course Name : Digital Signal Processing
Course Code : A404314/ A402313
Branch : ECE/ EEE
Date & Session : 19-12-2025 AN **Duration: 3 hours** **Max. Marks: 60**

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | |
|---|-----|
| 1. List the Classification of Discrete time systems. | 1 M |
| 2. What is Interpolation? | 1 M |
| 3. Define DFT and IDFT. | 1 M |
| 4. Draw the Butterfly Diagram for DIT-FFT. | 1 M |
| 5. Distinguish between Butterworth and Chebyshev | 1 M |
| 6. What is Warping Effect? | 1 M |
| 7. What are the Design Methods of FIR Filters? | 1 M |
| 8. Mention the Different types of windows in FIR Filters. | 1 M |
| 9. Define Z-Transform. | 1 M |
| 10. What is meant by limit cycle oscillations? | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | |
|--|-----|
| 11.A). For the difference equation given by
$y(n) - 4y(n - 1) + 4y(n - 2) = x(n) - x(n - 1)$ with the initial conditions
$(-1) = 1$ and $y(-2) = 1$. Find the Homogenous Solution. | 10M |
| OR | |
| 11. B). With neat diagram explain interpolation by a factor I and obtain an expression for interpolated signal. | 10M |
| 12. A). Solve for the Convolution of the sequence given by
$x(n) = (3, -1, 0, 1, 2, 3, 0, 1, 1, 2)$ and $h(n) = (1, 1, 1)$ by using Overlap Save Method. | 10M |
| OR | |
| 12. B). Compute the 8-point DFT of $x(n) = (2, 2, 2, 2, 1, 1, 1, 1)$ by using radix-2 DIT-FFT Algorithm. | 10M |
| 13. A). Design a Butterworth analog low pass filter that will meet the following specifications. 10M
i) maximum pass band attenuation = -2db.
ii) pass-band edge frequency = 20 rad/sec.
iii) minimum stop-band attenuation = -10db.
iv) stop band edge frequency = 30 rad/sec. | |
| OR | |
| 13. B). Determine the order and the pole of the Type -I Chebyshev low pass filter from the given specifications. $\alpha_p = 1\text{dB}$; $\alpha_s = 40\text{dB}$; $\Omega_p = 1000 \pi \text{ rad/sec}$; $\Omega_s = 2000 \pi \text{ rad/sec}$. | 10M |

(P.T.O.)

14. A). Design an ideal low pass filter with frequency response 10M

$$H_d(e^{j\omega}) = 1 \text{ for } -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2}$$
$$= 0 \text{ for } \frac{\pi}{2} \leq \omega \leq \pi$$

Find the values of $h(n)$ using hamming window for $N=11$, Find $H(z)$.

OR

14. B). Compare FIR and IIR Filters. 10M

15. A). Obtain the Direct Form – I, Direct Form – II, Cascade and Parallel Form realization for 10M
the system $y(n) = -0.1 y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$.

OR

15. B). Write Short notes on: 10M
i) Limit Cycles
ii) Overflow Oscillations
iii) Dead band effects



CMR COLLEGE OF ENGINEERING & TECHNOLOGY (UGC AUTONOMOUS)

Examination	: B.Tech VI Semester Supplementary Examinations Nov/Dec-2025	
Course Name	: Professional Practice, Law & Ethics	
Course Code	: A404317	
Branch	: Electronics & Communication Engineering	
Date & Session	: 12-12-2025 AN	Duration: 3 hours
		Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | | |
|-----|---|-----|
| 1. | What is the difference between a gift and a bribe in ethical terms? | 1 M |
| 2. | Define 'Negligence' in engineering context. | 1 M |
| 3. | What is 'free consent' in contracts? | 1 M |
| 4. | Define legality of object under contract law. | 1 M |
| 5. | Compare Arbitration and Negotiation. | 1 M |
| 6. | State the purpose of the UNCITRAL Model Law in ADR. | 1 M |
| 7. | Name any two rights of workers under the Building and Construction Workers Act. | 1 M |
| 8. | List two key features of the RERA Act, 2017. | 1 M |
| 9. | What is a trademark in the context of IPR? | 1 M |
| 10. | Define Copyright as per Indian law. | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | | |
|--------|--|-----|
| 11.A). | Evaluate the role of GST in engineering ethics and how it impacts stakeholders in infrastructure projects. | 10M |
|--------|--|-----|

OR

- | | | |
|---------|---|-----|
| 11. B). | Apply ethical principles to explain how conflicts of interest arise in engineering practices and suggest mitigation strategies. | 10M |
| 12. A). | Illustrate 'Capacity to Contract' with engineering-based real-life examples. | 10M |

OR

- | | | |
|---------|--|-----|
| 12. B). | Analyze the differences between Conditions and Warranties under the Sale of Goods Act with examples. | 10M |
| 13. A). | Compare the Arbitration and Conciliation Acts of 1940 and 1996 and highlight improvements. | 10M |

OR

- | | | |
|---------|---|-----|
| 13. B). | Critically evaluate the effectiveness of Lok Adalats in addressing civil disputes. | 10M |
| 14. A). | Create a report outlining labour engagement strategies and relevant Indian labour laws. | 10M |

OR

- | | | |
|---------|--|-----|
| 14. B). | Explain with examples the Workmen's Compensation Act and its relevance to safety compliance. | 10M |
| 15. A). | Outline the patent registration procedure under the Patents Act, 1970. | 10M |

OR

- | | | |
|---------|---|-----|
| 15. B). | Critically analyze Indian legal provisions against software piracy and propose preventive measures. | 10M |
|---------|---|-----|

H.T No:

--	--	--	--	--	--	--	--	--	--

R22



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination : B.Tech VI Semester Supplementary Examinations Nov/Dec-2025
Course Name : Embedded System Design
Course Code : A404406
Branch : Electronics & Communication Engineering
Date & Session : 13-12-2025 AN **Duration:** 3 hours **Max. Marks:** 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions
Each question carries ONE mark.

10x1=10M

1. Mention any two characteristics of embedded systems. 1 M
2. Why are embedded systems used in real-time applications? 1 M
3. Which is more efficient in terms of cost: ASIC or PLD for mass production? 1 M
4. Choose a suitable sensor for a temperature monitoring system. 1 M
5. What is the function of a watchdog timer? 1 M
6. What component prevents damage due to low voltage in embedded systems? 1 M
7. What causes delay in task execution under non-preemptive scheduling? 1 M
8. Which is better for multitasking: cooperative or preemptive scheduling? 1 M
9. Identify a situation where RPC can be used. 1 M
10. State any one method of task synchronization. 1 M

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- 11.A). Define an embedded system and list its major characteristics with examples. 10M
- OR**
11. B). Analyze the quality attributes of embedded systems. 10M
12. A). Choose appropriate memory and processors for a digital thermostat and justify your selection. 10M
- OR**
12. B). Describe the core components of a typical embedded system. 10M
13. A). Define the purpose of a Reset Circuit and a Watchdog Timer in embedded systems. 10M
- OR**
13. B). Analyze how a Brown-out Protection Circuit helps maintain system stability during power fluctuations. 10M
14. A). Evaluate the impact of using RTOS in multi-processing and multi-tasking. 10M
- OR**
14. B). Explain the concept of task scheduling in an RTOS with a simple example. 10M
15. A). Analyze the role of shared memory and mutexes in managing data consistency in a dual core. 10M
- OR**
15. B). List different task communication methods used in RTOS environments. 10M



CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	: B.Tech VI Semester Supplementary Examinations Nov/Dec-2025		
Course Name	: Digital Image Processing		
Course Code	: A404404		
Branch	: Electronics & Communication Engineering		
Date & Session	: 13-12-2025 AN	Duration: 3 hours	Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A

Answer all TEN questions

Each question carries ONE mark.

10x1=10M

- | | |
|--|-----|
| 1. Compare binary image and color image. | 1 M |
| 2. What is meant by path? | 1 M |
| 3. Define histogram. | 1 M |
| 4. Summarize about Median filter. | 1 M |
| 5. Identify what is image restoration? | 1 M |
| 6. List the two methods of algebraic approach. | 1 M |
| 7. Define an edge. | 1 M |
| 8. Write the mask of the Sobel operator. | 1 M |
| 9. Write about spatial redundancy. | 1 M |
| 10. What is a fidelity criterion? | 1 M |

PART-B

Answer the following. Each question carries TEN Marks.

5x10=50M

- | | |
|--|-----|
| 11.A). Explain various relationships between pixels. | 10M |
| OR | |
| 11. B). i) State and prove separability property of 2D-DFT. | 5M |
| ii) Explain the role of Discrete Cosine transform in image processing. | 5M |
| 12. A). Explain the following point processing methods | 10M |
| i) Image negatives | |
| ii) Log transformations | |
| iii) Intensity level slicing | |
| OR | |
| 12. B). Write notes on sharpening spatial filtering. | 10M |
| 13. A). i) Differentiate the Image Enhancement and Image Restoration. | 5M |
| ii) Draw the degradation/restoration model in image processing and describe the each part presented on it. | 5M |
| OR | |
| 13. B). Explain least mean square filters with necessary equations. | 10M |
| 14. A). Explain detection of discontinuities. | 10M |
| OR | |
| 14. B). Discuss about opening and closing for gray scale images. | 10M |
| 15. A). i) Summarize the various types of data redundancies. | 5M |
| ii) Explain fidelity criteria. | 5M |
| OR | |
| 15. B). With the help of block diagram explain about transform based compression technique. | 10M |
