

Enrollment No.

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B. TECH. (ECE)
IV YEAR, VII SEMESTER EXAMINATION
MICROWAVE THEORY AND TECHNIQUES

[Time : 3:00 Hours]

[Max. Marks : 70]

NOTE: - ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.

QUESTION NO.-1: ATTEMPT ANY FOUR PARTS.

(4*3=12)

- Define the microwave frequency range and list the major microwave frequency bands.
- Write short notes on EMI and EMC in microwave systems.
- Explain the function of a Directional Coupler.
- What are scattering parameters and why are they used in microwave analysis?
- Mention the types of losses associated with microwave transmission.
- Differentiate between TEM, TE, and TM modes in microwave transmission.

QUESTION NO.-2: ATTEMPT ANY THREE PARTS.

(3*4=12)

- Explain the working of Gunn diode with its characteristics.
- Describe the role of impedance matching in microwave design.
- Write short notes on: (a) Klystron (b) Magnetron
- Discuss the measurement of microwave frequency using a frequency meter.

QUESTION NO.-3: ATTEMPT ANY THREE PARTS.

(3*6=18)

- Derive and explain the expression for impedance in microwave transmission lines.
- Explain the construction and operation of TWT and compare it with Klystron amplifier.
- Explain the design principles of microwave filters and their importance in communication systems.
- Analyze the equivalent voltage and current relations for non-TEM lines.

QUESTION NO.-4: ATTEMPT ANY TWO PARTS.

(2*7=14)

- Evaluate the role of radar in modern microwave systems and discuss its basic block diagram.
- Discuss in detail the measurement of S-parameters using a Network Analyzer and its importance in microwave engineering.
- Design considerations for Microwave Oscillator and Mixer circuits with relevant equations and block diagrams.

QUESTION NO.-5: ATTEMPT ANY TWO PARTS.

(2*7=14)

- Describe the role of RFID and GPS in microwave communication systems.
- Explain the effects of microwaves on the human body with safety considerations.
- Explain in detail the operation of a Magnetron and its applications.

Printing Pages : 1

Paper Code : BECE-721

(B) (SVSU): 2025-2026/R

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B. TECH. (ECE)
IV YEAR, VII SEMESTER EXAMINATION
FIBER OPTIC COMMUNICATION

[Time : 3:00 Hours]

[Max. Marks : 70]

NOTE: - ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.

QUESTION NO. 1: ATTEMPT ANY FOUR PARTS.		[3×4=12]	CO/K
A)	State the Spectral bands used in OFC with their wavelengths.		CO1, K1
B)	State the comparisons between three types of optical amplifiers.		CO4, K4
C)	Explain the construction of an optical fiber?		CO1, K2
D)	Explain WDM networks.		CO4, K2
E)	Explain how Raman Amplifiers work.		CO4, K2
F)	Explain the concept of solitons.		CO5, K2
QUESTION NO. 2: ATTEMPT ANY THREE PARTS.		[4×3=12]	
A)	What is difference between attenuation and signal distortion in optical fibers?		CO2, K2
B)	Explain linear polarization with the help of suitable diagram.		CO1, K2
C)	Explain Modal Analysis of a Step-Index fiber using suitable equation.		CO1, K4
D)	Explain how light gets amplified in EDFA.		CO4, K2, K3
QUESTION NO. 3: ATTEMPT ANY THREE PARTS.		[6×3=18]	
A)	Distinguish between WDM and DWDM. What is the base frequency and channel spacing specified by ITU for DWDM?		CO4, K4, K1
B)	Explain the working of OTDR apparatus for field measurement.		CO2, K3
C)	Explain, with suitable diagram, EDFA amplification mechanism and architecture.		CO4, K3
D)	Differentiate between Step-Index and Graded- Index Fibers and write their applications.		CO1, K4
QUESTION NO. 4: ATTEMPT ANY TWO PARTS.		[7×2=14]	
A)	What are direct band gap and indirect band gap type of semiconductors? Give at least two examples.		CO3, K1
B)	Explain the working of an optical fiber communication system with the help of a suitable block diagram.		CO1, K2
C)	Explain the light amplification mechanism in LASER with suitable diagram.		CO3, K2
QUESTION NO. 5: ATTEMPT ANY TWO PARTS.		[7×2=14]	
A)	What is self-phase and cross-phase modulation? Explain in detail.		CO5, K1, K2
B)	Draw the schematic of a high-radiance surface-emitting LED and an edge-emitting double-hetero-junction LED and explain their operation in brief.		CO3, K3
C)	Explain the methods of field measurement of OFC.		CO2, K3

Printing Pages : 1

Paper Code : BECE-731

(C) (SVSU): 2025-2026/R

Enrollment No.

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B. TECH. (ECE)

**IV YEAR, VII SEMESTER EXAMINATION
SATELLITE COMMUNICATION**

[Time : 3:00 Hours]

[Max. Marks : 70]

NOTE:- ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.**QUESTION NO. 1: ATTEMPT ANY FOUR PARTS.**

(4*3=12)

- (a) What are the main principles of satellite communication?
- (b) Explain briefly the history of satellite systems.
- (c) Define apogee, perigee, and eccentricity for an orbit.
- (d) Differentiate between solar day and sidereal day.
- (e) Discuss the types of satellite orbits and their uses.
- (f) Explain the importance of Kepler's second law in satellite motion.

QUESTION NO. 2: ATTEMPT ANY THREE PARTS.

(3*4=12)

- (a) Write a detailed note on the communication subsystem.
- (b) Explain the working of telemetry, tracking, and command subsystem.
- (c) Discuss the functions of attitude and orbit control system (AOCS).
- (d) Explain the thermal control subsystem in satellites.

QUESTION NO.-3: ATTEMPT ANY THREE PARTS.

(3*6=18)

- (a) Explain the concept of Doppler shift in satellite communication with derivation.
- (b) Describe Sun Transit Outage phenomena and suggest remedies.
- (c) Discuss the causes and effects of solar eclipse on communication satellites.
- (d) Explain in detail the preparation of a satellite link budget with assumptions.
- (e) Discuss noise sources and their effects on received signal power.

QUESTION NO. 4: ATTEMPT ANY TWO PARTS.

(2*7=14)

- (a) Derive an expression for system noise temperature and noise power.
- (b) Explain C/N ratio and its variation under clear and rainy conditions.
- (c) Calculate the received signal power for given flux density and antenna parameters.

QUESTION NO. 5: ATTEMPT ANY TWO PARTS.

(2*7=14)

- (a) Explain the working principle of TDMA and its advantages.
- (b) Compare TDMA and FDMA techniques with neat diagrams.
- (c) Explain the concept of CDMA and its use in satellite communication

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B.TECH (ECE)

 IV YEAR, VII SEMESTER EXAMINATION
 SATELLITE COMMUNICATIONS

 25ET111085185
 22/12/2025

[Time : 03:00 Hours]

[Max. Marks : 70]

NOTE:- ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.

Ques.1: Answer any four of the following questions. (3X4=12)

- Explain the working of satellite with proper diagram
- What are various elements of Satellite Communication link? Explain with the help of Diagram.
- What is need of satellite communication?
- What are Apogee and Perigee Heights in satellite orbit?
- How eclipse effect on the working of a satellite? Explain in brief.
- What is station keeping?

Ques.2: Answer any three of the following questions. (4X3=12)

- Explain Kepler's Third Law. The orbital period of a satellite is 650 min. Determine the semi-major axis of the elliptical orbit.
- What are look angles? Explain how they are determined for geo stationary orbits?
- Explain Uplink satellite and Downlink Satellite circuits.
- Discuss the advantages and disadvantages of the 6/4 GHz band used in satellite communication.

Ques.3: Answer any three of the following questions. (6X3=18)

- Elaborate about Overall System Noise Temperature. Give relation between Noise Figure and Noise Temperature.
- A 12 GHz receiver consists of an RF stage with Gain $G_1 = 30$ dB and Noise temperature $T_1 = 20$ K, a down converter with gain $G_2 = 10$ dB and noise temperature $T_2 = 360$ K and IF amplifier stage with gain $G_3 = 15$ dB and noise temperature $T_3 = 1000$ K. Calculate the effective noise temperature and noise figure of the system. Take the reference temperature to be 290 K.
- Describe the telemetry, tracking and command subsystem with reference to an earth station.
- What is FSK and ASK techniques used in satellite communications?

Ques.4: Answer any two of the following questions. (7X2=14)

- Differentiate between FDMA, TDMA and CDMA Multiple Access Techniques used in Satellite Communications.
- Discuss in detail about Uplink design and Downlink design of a satellite.
- The semi-major axis and semi-minor axes of an elliptical satellite orbit are 20000 Km and 1600 Km respectively. Find apogee and perigee distances.

Ques.5: Answer any two of the following questions. (7X2=14)

- In a satellite communication link, the uplink carrier to noise ratio $(C/N)_U$ is 20 dB where as the downlink carrier to noise ratio $(C/N)_D$ is 25 dB. Find the link carrier to noise ratio.
- What do you understand by Satellite Link Design? Derive Complete Link Design for satellite.
- Derive general link equation. Find out expression for C/N and G/T ratio. Explain the importance of the satellite link design.

Printing Pages : 1

Paper Code : BECE-721

(A) (SVSU): 2025-2026/R

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B. TECH. (ECE)

**IV YEAR, VII SEMESTER EXAMINATION
FIBER OPTIC COMMUNICATION**

[Time : 3:00 Hours]

[Max. Marks : 70]

NOTE: - ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.

QUESTION NO. 1: ATTEMPT ANY FOUR PARTS.		[3×4=12]	CO/K
A)	Define reflection and TIR with suitable diagrams.		CO1, K1
B)	State the advantages of optical fibers over copper cables.		CO1, K1
C)	Explain the construction of an optical fiber?		CO1, K2
D)	Explain wave model of light?		CO1, K2
E)	Explain the principle of Raman Amplifiers.		CO4, K2
F)	What is the purpose of optical switches?		CO4, K2
QUESTION NO. 2: ATTEMPT ANY THREE PARTS.		[4×3=12]	
A)	Explain the different advantages and disadvantages of optical communication?		CO1, K2
B)	Explain types of optical sources?		CO3, K2
C)	Compare, in brief the three types of optical amplifiers.		CO4, K4
D)	Explain Modal Analysis of a Step-Index fiber using suitable equation.		CO1, K2, K3
QUESTION NO. 3: ATTEMPT ANY THREE PARTS.		[6×3=18]	
A)	Distinguish between WDM and DWDM. What is the base frequency and channel spacing specified by ITU for DWDM?		CO4, K4, K1
B)	Explain the working of OTDR apparatus for field measurement.		CO2, K3
C)	Explain, with suitable diagram, EDFA amplification mechanism and architecture.		CO4, K3
D)	Differentiate between Step-Index and Graded- Index Fibers and write their applications.		CO1, K4
QUESTION NO. 4: ATTEMPT ANY TWO PARTS.		[7×2=14]	
A)	Why are non-linear effects observed in optical fibers? Explain, in brief, the classification of non-linearities in optical systems.		CO5, K5, K2
B)	Explain the working of an optical fiber communication system with the help of a suitable block diagram.		CO1, K2
C)	Explain the light amplification mechanism in LASER with suitable diagram.		CO3, K2
QUESTION NO. 5: ATTEMPT ANY TWO PARTS.		[7×2=14]	
A)	Define in reference to Digital Receiver Performance: Probability of error, Receiver sensitivity, Quantum limit.		CO3, K1
B)	Draw the schematic of a high-radiance surface-emitting LED and an edge-emitting double-hetero-junction LED and explain their operation in brief.		CO3, K3
C)	A 4-port multimode fiber FBT coupler has 60μW optical power launched into port 1. The measured output powers at ports 2, 3 and 4 are .004, 26.0 and 27.5 μW respectively. Determine the excess loss, insertion losses between input and output ports, the cross-talk and split ratio for the device.		CO4, K5

Printing Pages : 1

Paper Code : BECE-711

(B) (SVSU): 2025-2026/R

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B. TECH. (ECE)
IV YEAR, VII SEMESTER EXAMINATION
MICROWAVE THEORY AND TECHNIQUES

[Time : 3:00 Hours]

[Max. Marks : 70]

NOTE: - ATTEMPT ALL THE QUESTIONS AS PER GIVEN INSTRUCTIONS.**QUESTION NO.-1: ATTEMPT ANY FOUR PARTS.****(4*3=12)**

- a) List the various microwave frequency bands and their applications.
- b) Define EMI and EMC and explain their importance.
- c) What are the main applications of microwaves in civil engineering?
- d) What are the key differences between coaxial line and microstrip line?
- e) What are the typical losses encountered in microwave transmission lines?
- f) Write a short note on scattering parameters.

QUESTION NO.-2: ATTEMPT ANY THREE PARTS.**(3*4=12)**

- a) Draw and explain the construction of a rectangular waveguide.
- b) Compare the characteristics of TE and TM modes.
- c) What are S-parameters? Derive their basic properties.
- d) Explain the construction and working of a PIN diode.

QUESTION NO.-3: ATTEMPT ANY THREE PARTS.**(3*6=18)**

- a) Derive the expression for the characteristic impedance of a coaxial line.
- b) Explain the design of a microwave power amplifier.
- c) Describe the working of a Traveling Wave Tube (TWT).
- d) Explain the process of impedance transformation and its applications.

QUESTION NO.-4: ATTEMPT ANY TWO PARTS.**(2*7=14)**

- a) Explain the effects of microwaves on the human body with safety considerations.
- b) Explain in detail the operation of a Magnetron and its applications.
- c) Evaluate the applications of radar systems and explain its basic block diagram.

QUESTION NO.-5: ATTEMPT ANY TWO PARTS.**(2*7=14)**

- a) Evaluate the performance and applications of microwave antennas used in satellite systems.
- b) Design and explain a low-noise amplifier (LNA) for microwave systems.
- c) Describe the role of RFID and GPS in microwave communication systems.
