33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2071 Bhadra**

| Exam. | Regular / Back | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

***Subject:*** - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Derive a relation for the field intensity for the array of two elements isotropic radiators in various conditions. Show the condition for broad side and end fire array with necessary diagrams. [5+6]
2. Explain any five parameters of antenna. [5]
3. Compare Yagi antenna with log periodic antenna. Explain the working principle and design of log-periodic antenna. [2+8]
4. A parabolic reflector antenna having antenna efficiency 85% is designed for 3 GHz resonant frequency with 2.5 dB waveguide loss. Find out the antenna diameter if effective isotropic radiated power (EIRP) is calculated 46 dBW and transmitting power is 500 W. [8]
5. Write down the factors which affect the space wave communication. Explain the major characteristics of MW and SW radio propagation. [5+6]
6. With a mathematical relation of refractive index of ionospheric layer derive a relation of critical frequency and maximum usable frequency (MUF) of radio waves with necessary explanation. Consider the earth is not curved. [8]
7. How do you get Friis transmission equation and path loss in case of free space wave propagation? [4+3]
8. Explain the working principle and design of (a) Marconi antenna (b) Rhombic antenna. [5+5]
9. Explain the construction, light propagation mechanism and application of different types of optical fiber. [10]

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
# Examination Control Division
**2071 Bhadra**

| Exam. | Regular / Back | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

## *Subject:* - Propagation and Antenna *(EX653)*

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
# Examination Control Division
**2070 Bhadra**

| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

## *Subject:* - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define antenna. Describe the operation of infinitesimal dipole with the help of mathematical relations and the field pattern. [2+8]
2. Explain the following antenna parameters: [2+2]
   a) Half Power Beamwidth
   b) Directivity
3. State the principle of pattern multiplication. Use the principle to obtain a wave pattern for array of two short dipoles for following cases where (d) = dipole separation and ($\alpha$) = current phase difference. [2+3+3]
   a) Dipoles aligned perpendicular to the array axis with $d = \lambda/2$, $\alpha = 0$
   b) Dipoles aligned perpendicular to the array axis with $d = \lambda/2$, $\alpha = \pi$
4. Explain the working principle of Rhombic antenna. [4]
5. Derive the relation for flare angle and length of a pyramidal horn antenna. [5]
6. Explain the construction, working principle and design feature of Log Periodic Antenna. [10]
7. With a neat diagram, explain the designation of radio waves according to the path they follow during propagation. Also, compare the propagation characteristics for different radio bands. [4+6]
8. a) Describe knife edge diffraction phenomenon. [5]
   b) Explain the effect of space wave propagation on the ground of plane and actual earth. [5]
9. Where are optical fibres most widely used? Explain the various advantages and disadvantages of optical fibers over metal wire communication. [10]
10. What is an acceptance angle? Derive and expression to calculate the acceptance angle. [2+7]

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INSTITUTE OF ENGINEERING
**Examination Control Division**
**2069 Bhadra**

| Exam. | Regular (2066 & Later Batch) | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

## *Subject:* - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain the characteristics of $\lambda/2$, $\lambda$ and $1.28\lambda$ length dipoles where $\lambda$ is the wavelength of operating frequency. [6]
2. Explain the mechanism by which the electric line of forces are detached from the dipole antenna to form the free space waves. [4]
3. Explain the following antenna parameters; (a) Antenna efficiency (b) Polarization. [4]
4. Define antenna arrays and also derive a mathematical expression for the array of two element isotropic radiators. [6]
5. Explain the construction, working principle and design of an Yagi antenna. [10]
6. Explain the fundamentals as well as importance of ground and ground system construction in vertical monopole antenna. [8]
7. In case of radio wave propagation define surface, ground reflected, direct and sky waves. Also, compare the propagation characteristics of different bands of radio frequencies. [4+8]
8. Derive an expression for the path loss in case of radio wave propagation. [12]
9. Explain the advantages and disadvantages of optical fibre communication over the metallic wire communication system. [12]
10. Explain the dispersion and attenuation properties of an optical fibre. [6]

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INSTITUTE OF ENGINEERING

# Examination Control Division

**2075 Bhadra**

| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

## *Subject:* - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is an antenna? Explain the conditions that any type of conductor can radiate electromagnetic wave or not. [2+4]
2. State the reciprocity theorem and compensation theorem for an antenna system. [2+2]
3. Explain the following antenna parameters: (i) Antenna efficiency (ii) Polarization (iii) Band width [3×3]
4. Explain all the layers of ionosphere and their importance to radio wave communication. [6]
5. Microwave link is assumed to be free space condition. The antenna gains are each 40 dB, the frequency is 10 GHz and the path length is 90 km. Calculate the transmission path loss and received power for transmitted power of 10 Kw. [6]
6. What do you mean by aperture antenna? Explain the construction, working principle and the feeding mechanism for Parabolic Antenna. [1+6]
7. Explain the working principle, construction, design, advantages and application of Yagi-Uda antenna. [7]
8. What is Maximum Usable Frequency (MUF)? Derive the expression of MUF critical frequency ($f_{crt}$) and skip distance assuming curve earth. [2+8]
9. Describe with the aid of neat diagram the basic principle of total internal reflection that enables the fiber to work as a "light conduit". [6]
10. List out different optical sources and explain the losses in optical fiber briefly. [2+5]
11. Write short notes on: (any three) [3×4]
    i) Marconi antenna
    ii) Knife edge diffraction
    iii) Radio frequency spectrum
    iv) Optical source and Optical detector

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2075 Baisakh**

| Exam. | Back | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

## *Subject:* - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. What is an antenna? Explain how electromagnetic waves are generated by a conductor. [2+4]
2. Derive an expression for the total field in case of two isotropic point sources with equal amplitude and opposite phase. [6]
3. Name the parasitic elements used in Yagi-Uda array. Explain their significance in the array. Compare Yagi-Uda antenna with Log periodic dipole array. [1+2+4]
4. Explain skip distance and derive the expression for skip distance (D) for flat earth surface. [8]
5. Describe the antenna gain, antenna efficiency and directivity of antenna with mathematical derivation if necessary. [6]
6. Find the received power (in dBm) at a distance of 0.5 km over a free space 1 GHz circuit consisting of a transmitting antenna with 25 dB gain and a receiving antenna gain of 20 dB. The power radiated by the transmitting antenna is 150 W. [5]
7. What is ionosphere? Explain the ionosphere wave propagation showing its different layers. [1+5]
8. List the major characteristics of Marconi antenna with necessary figures. [6]
9. Discuss loss or signal attenuation in an optical fiber with respect to absorption, scattering and bending losses. [8]
10. Define free space communication. Derive complete equation including path loss using friis space communication. [2+8]
11. Write short notes on: (any three) [3×4]
    a) Parabolic reflector antenna
    b) Compare between broadside array and endfire array
    c) Knife edge diffraction phenomenon
    d) Optical source and Optical detector

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33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
**Examination Control Division**
**2074 Bhadra**

| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

***Subject:*** - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Explain retarded potential and their importance. Describe infinitesimal dipole with the help of suitable diagram, mathematical relations and the field pattern. [2+6]
2. Explain the following antenna parameters. [2+2+2]
   (a) Radiation pattern (b) Antenna gain (c) Polarization
3. State following antenna theorems: (a) Reciprocity (b) Compensation [2+2]
4. What is Skip distance? Derive the relationship between critical frequency ($f_{cr}$) and Skip distance (D) assuming flat earth for both antennas. [7]
5. A parabolic reflector antenna having antenna efficiency 75% is designed for 5GHz resonance frequency with 3dB waveguide loss. If Effective Isotropic Radiated Power (EIRP) is calculated 50dBW and transmitting power is 600W calculate its diameter. [8]
6. The antenna of a TV transmitter is located at a height of 125m above ground level. Calculate the distance up to which the LOS communication is possible if the height of receiving antenna is to be 9m. [6]
7. Describe the construction, working principle, and design of Yagi-Uda antenna with necessary diagrams. [8]
8. What is a radio frequency spectrum? Give major propagation characteristics of VHF and UHF bands. [2+6]
9. Define the following: (a) MUF (b) Virtual height
10. Draw the optical fiber communication system. What are the advantages and disadvantages of optical fibers over metal wire communication? [3+6]
11. Write short notes on: (Any four) [4×4]
    a) Helical antenna
    b) Super refraction
    c) Knife edge diffraction
    d) Numerical aperture (NA)
    e) Logarithmic antenna

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INSTITUTE OF ENGINEERING
**Examination Control Division**
**2073 Magh**

| Exam. | New Back (2066 & Later Batch) | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
| Programme | BEX | Pass Marks | 32 |
| Year / Part | III / II | Time | 3 hrs. |

***Subject:*** - Propagation and Antenna *(EX653)*

- ✓ Candidates are required to give their answers in their own words as far as practicable.
- ✓ *Attempt **All** questions.*
- ✓ *The figures in the margin indicate **Full Marks**.*
- ✓ *Assume suitable data if necessary.*

1. Define an antenna? List the various types of wired antenna with their radiation pattern and polarization. [2+4]
2. List the parameters of antenna and explain any three of them. [2+6]
3. State the following antenna theorems: [2+2]
   i) Compensation
   ii) Reciprocity
4. Explain the construction, working principle and design of log-periodic antenna. [7]
5. Describe the cassegrain method of feeding parabolic reflectors. [6]
6. Explain the phenomenon of Duct propagation. [5]
7. Find the maximum range of tropospheric transmission for which the transmitting antenna height is 100 ft and receiving antenna is 50 ft. [5]
8. What is the main difference between standing wave antenna and travelling wave antenna? Explain with a neat sketch the construction, working principal and characteristic of V antenna. [3+5]
9. Explain the construction, working principle and design of a Yagi-antenna. Design a 5∠ element Yagi antenna with operating frequency of 800MHZ and dipole as driven element. Take effective dipole length of $0.48\pi$ spacing. [5+6]
10. Explain the construction, light propagation mechanism and application of different types of optical fiber. [8]
11. Write short notes on: (any three) [3×4]
    i) Marconi antenna
    ii) Knife edge diffraction phenomenon
    iii) Effective isotropic radiated power (EIRP)
    iv) Multimode graded index fiber
    v) MW propagation

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33 TRIBHUVAN UNIVERSITY

INSTITUTE OF ENGINEERING

# Examination Control Division

**2073 Bhadra**

| Exam. | Regular | | |
|---|---|---|---|
| Level | BE | Full Marks | 80 |
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## *Subject*: - Propagation and Antenna *(EX653)*

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- ✓ *Attempt **All** questions.*
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1. Explain briefly radiation mechanism in single wire antenna. [5]
2. What is a linear array? Differentiate between a broadside array and end firearray. [1+4]
3. Explain the constructional features, operating principle and characteristics of rhombic antenna. [8]
4. Explain parabolic reflector antenna with characteristics, radiation pattern and feed system. [7]
5. Briefly discuss the propagation characteristics of space wave and sky wave. [8]
6. A parabolic reflector antenna having the antenna efficiency 85% is designed for 3 GHz resonant frequency with 2.5 dB wavelength loss. Find out the antenna diameter if effective isotropic radiated power (EIRP) is calculated 46 dBW and transmitting power is 500 watt. [8]
7. Write down the factors which affect the surface wave communication. Explain the major characteristics of MW and SW radio propagation. [2+6]
8. Derive the expression for the path loss in case of radio wave propagation. [6]
9. What are the various elements of an optical communication system? Explain each element in brief. [8]
10. Compare optical fiber communication with cable and radio communication systems. Describe numerical aperture (NA) in optical communication system. [4+4]
11. Write short notes on: (Any three) [3×3]
    - i) Helical antenna
    - ii) Tropospheric scatter propagation
    - iii) Firiis transmission equation
    - iv) Printed antenna
    - v) Pyramidal horn antenna

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