TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2077 Chaitra

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

Subject: - Propagation and Antenna *(EX 653)*

- ✓ 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. State the following antenna theorem: [2+2]
   a) Maximum power transfer
   b) Reciprocity
2. Explain the following antenna parameters: [3×2]
   a) Radiation patterns
   b) Polarization
   c) Beam width
3. What is the importance of antenna array? Describe the principle of End fire and Broadside array. [2+6]
4. How are aperture type of antennas different from the conventional antennas? Explain the theory of radiation from a rectangular horn. [2+4]
5. Explain the operation of ionospheric communication with the help of different layers created in the atmosphere. [8]
6. A parabolic reflector antenna having antenna efficiency 75% is designed for 3 GHz resonant frequency with 2.5dB waveguide loss. Find out the antenna diameter if effective isotropic radiated power (EIRP) is calculated 46dBW and transmitting power is 500W. [7]
7. Draw the structure, radiation pattern and explain the working of a V-antenna. [6]
8. Explain the helical antenna with respect to structural design, working principle in axial mode and normal mode, their merits, demerits and applications. [8]
9. Explain the contribution of microscope and macroscopic fiber bends towards the bending losses in optical fiber. [7]
10. List out different optical sources and explain the losses in optical fiber briefly. [2+6]
11. Write short notes on: (Any Three) [3×4]
    a) Effective isotropic radiated power (EIRP)
    b) Marconi antenna
    c) Fresnel diffraction at a knife edge
    d) Optical source and Optical detector

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Baisakh

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

Subject: - Propagation and Antenna *(EX 653)*

- ✓ 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 element isotropic radiators with current equal in magnitude but opposite in phase. Show the condition for maxima and minima direction of intensity and draw the radiation pattern. [6+3]
2. What is the importance of antenna array? Differentiate between End fire and Broadside array. [2+6]
3. Explain the following antenna parameters. [2 x 3]
   a) Radiation patterns.
   b) Antenna gain and directivity
   c) Beam width
4. Sketch the current distribution and radiation pattern of center-fed vertical dipole for following lengths. [4]
   i) $\lambda/2$
   ii) $3\lambda/2$
5. 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]
6. Draw the structure of ionosphere and explain the mechanism of ionosphere propagation. [6]
7. Define transmission loss. Derive the Firiss transmission equation of free space propagation. [2+6]
8. What is the maximum power that can be received over a distance of 15.5 Km line-of-sight free space with a 3.4 GHz frequency consisting of the transmitting antenna gain of 25 dB and receiving antenna diameter 6.4m with 75% antenna efficiency? Where transmitted power is 250W. [7]
9. Explain the construction and types of optical fiber with necessary diagrams. [5]
10. What are the various feature of graded index fiber? Explain the refractive index profile and ray transmission in a multimode graded index fiber. [3+5]
11. Write short notes on (any three): [3 x 4]
    i) Corner reflector antenna
    ii) V antenna
    iii) Critical frequency
    iv) Light sources in optical communication

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2076 Bhadra

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

Subject: - Propagation and Antenna *(EX 653)*

- ✓ 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 the retarded potential? Explain how electromagnetic waves are generated by a conductor. [2+4]
2. State following antenna theorem: (a) Maximum power transfer (b) Superposition theorem [3+3]
3. Explain the working principle, construction, advantages and application of V antenna. Sketch radiation patterns of both types of V antennas. [6+2]
4. Describe the antenna gain, antenna efficiency and antenna polarization with mathematical relation if necessary. [6]
5. What is reflector antenna? With necessary diagrams, explain parabolic reflector antenna and its different types of feeding systems. [1+6]
6. With neat diagram design the 5 element Yagi-Uda antenna for the receiving 100 MHz radio signal showing design steps. consider effective dipole length equal to 0.48 λc and spacing between elements is $0.15\lambda c$. [7]
7. Explain the importance of different layers in Ionospheric communication. [6]
8. Define and derive the relation of MUF and skip distance for the case of flat earth. [7]
9. Derive Friis transmission equation and path loss in case of free space propagation and find out distance of line of sight as: $d = 3.57\left(\sqrt{h_t} + \sqrt{h_r}\right)$Km [4+3]
10. Explain the construction and propagation mechanism and application of different types of optical fibers. Define numerical aperture. [5+2]
11. Where are optical fibers most widely used? Explain the various advantages and disadvantages of optical fibers over metal wire communication. [2+5]
12. Write short notes on: (Any two) [2×3]
    a) Knife edge diffraction phenomenon
    b) Rhombic Antenna
    c) MW Propagation

***

25 TRIBHUVAN UNIVERSITY
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

***

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

***

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

***

TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2073 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 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

***

33 TRIBHUVAN UNIVERSITY
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 0.48π 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

***

33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 Ashwin

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 retarded potential? Write the expression of retarded scalar potential and vector potential of infinitesimal dipole antenna in fraunhofer for field region. [2+4]
2. Explain how single wire can radiates electromagnetic waves with necessary radiation patterns and polarization. List the characteristics of omnidirectional antenna. [4]
3. Explain the following antenna parameters: [2×4]
   a) Antenna efficiency
   b) Directivity
4. Write the characteristics, working principle and operation of Rhombic antenna. [7]
5. Explain the phenomenon of Duct propagation. [5]
6. A 100 MHz circuit consists of a transmitting and receiving antenna of 30 dB and 25 dB gains respectively. The power radiated by the transmitting antenna is 120 W. using Friis transmission equation find the received power at a distance of 0.75 km over a free space. [6]
7. With neat diagram design the 5 element Yagi-Uda antenna for the receiving 100MHz radio signal showing design steps. [6]
8. Explain the ionospheric wave propagation showing its different layers. [6]
9. Find out the line of sight distance between the transmitting antenna and receiving antenna. If the transmitting antenna height is 45 m. and the receiving antenna height is 25 m. [Given: the radius of Earth is 6,378 km). [6]
10. What are the various elements of an optical communication system? Explain each element in brief. [8]
11. Compare the configuration of different types of fiber. Mention the advantages of single mode fiber. [4+2]
12. Write short notes on: (any four) [4×3]
    a) Marconi Antenna
    b) Friis equation and path loss in case of free space propagation
    c) Knife edge diffraction phenomenon
    d) NA for meridional rays in optical fiber
    e) Radio frequency spectrum

***

33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2072 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. Sketch the current distribution and radiation pattern of center – fed vertical dipole for following lengths. [6]
   i) λ
   ii) $3\lambda/2$
   iii) 2λ
2. State the following antenna theorems: [2+2]
   i) Superposition
   ii) Reciprocity
3. Describe antenna gain, antenna efficiency and beam width of antenna with mathematical derivations if necessary. [6]
4. Why we need antenna array rather than changing the length of single antenna? Derive the expression and draw the pattern for an array of two-isotropic radiators with: [2+6]
   i) Equal amplitude and phase
   ii) Equal amplitude and opposite phase
5. What is travelling wave antenna? Explain V-antenna with its characteristics and its types. [2+5]
6. Explain the following for ionospheric region: [2×2]
   i) Skip zone
   ii) Virtual height of a layer
7. Find out the relation between the critical frequency (f_{crt}) and the skip distance (D) if it is considered the Earth is flat for both antennas. [8]
8. What are the advantages of Yagi antenna? Design a 3-element yagi antenna with the operating frequency of 3GHz and dipole as driven element. [2+4]
9. Define maximum usable frequency. Derive the relation between the critical frequency and maximum usable frequency. [2+4]
10. What is an optical fiber? What are the different types of losses you can visualize in optical fiber communication? What are the advantages and disadvantages of multimode fiber over the single mode fiber? [1+4+5]
11. What properties do you think to be considered when an optical fiber is to be selected for any communication system? [6]
12. Write short notes on: (any three) [3×3]
    i) Horn antenna
    ii) Knife edge diffraction
    iii) Effective isotropic radiated power
    iv) Linear polarization
    v) Parasitic array antenna

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]

***

34 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2071 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. Describe the operation of infinitesimal dipole with necessary mathematical relation for electric field and magnetic field. What are basic antenna parameters? Explain briefly on any four parameters. [4+4]
2. Explain the different layers of ionosphere. What are the major characteristics of ionosphere? [5+3]
3. Explain the duct propagation mechanism in radio wave propagation. Define critical frequency and MUF with necessary derivations. [4+4]
4. What is the main difference between standing wave antenna and travelling wave antenna? Explain with a neat sketch the construction, working principle and characteristics of Rhombic antenna. [2+6]
5. What are the advantages of aperture antenna? List out the type of horn antenna and explain rectangular horn briefly. [2+6]
6. Why antenna radiation pattern lobes are important during antenna design? Derive the relation for the field intensity of linear array of 2 isotropic radiators with equal potential and 180° out of phase. [3+3]
7. What is travelling wave antenna? Explain the construction, working principle and characteristics of a V-antenna. [1+7]
8. Derive the expression for free space path loss propagation. Calculate free space path loss for 6 GHz frequency, if transmitter and receiver are 10,500 km line of sight apart. [5+3]
9. Explain the block diagram of optical communication and list out the advantages and disadvantages of it over cable communication. [3+5]
10. Describe the following terms: Numerical Aperture and Dispersion in Optical Fiber. [6]
11. Explain fressnel zone and knife edge diffraction. [4]

***

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 (α) = 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]

***

33 TRIBHUVAN UNIVERSITY
INSTITUTE OF ENGINEERING
Examination Control Division
2070 Magh

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

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. How does a single wire act as an antenna? During the transmission mode, explain the mechanism involved by which the electric lines of force are detached from the dipole antenna to form free space waves. [2+4]
2. Differentiate between: $\frac{\lambda}{2}$, λ and $3\frac{\lambda}{2}$ length dipoles in terms of their individual radiation pattern, self impedance and directivity; where λ is the wavelength of operation frequency. [6]
3. Explain the following antenna parameters: [2+2]
   i) Radiation Pattern Lobes
   ii) Polarization
4. Derive a mathematical relation to calculate the field intensity of an array for two element isotropic radiators. Draw the Resultant pattern for an End Fire Array with dipoles perpendicular to the axis of array with $d = \frac{\lambda}{2}$ & $\alpha = \pi$. Where, λ is the wavelength of the operating frequency? [4+4]
5. Explain the construction, working principle and characteristics of a V antenna with necessary diagrams. [7]
6. Explain the construction and working principle of a log periodic antenna. [8]
7. Define for ionospheric region: [2+2]
   i) Critical frequency
   ii) Virtual height of a layer
8. Assume that reflection take place at a height of 400 km and that the maximum density in the ionosphere corresponds to a 0.8 refractive index at 15 MHz. What will be the range (assume flat earth) for which the MUF is 20 MHz. [5]
9. Explain the phenomenon of Duct propagation. [4]
10. Describe Knife edge diffraction. [2]
11. Explain the effect of space wave propagation on the ground of plane and actual earth. [10]
12. What are advantages and disadvantages of multimode fiber over single mode fiber? Derive Expression of Numerical Aperture of a stepped index optical fiber. [3+7]
13. Briefly explain the advantage of optical fiber over metalled wire. [6]

***

36 TRIBHUVAN UNIVERSITY
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 $\lambda/2$, λ and 1.28λ length dipoles where λ 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]

***