BBF-003-1204007   Seat No. _____

M. Sc. (Sem. IV) (CBCS) Examination

July - 2021

Physics

(ET-11 : Electronics Communications)

Faculty Code : 003

Subject Code : 1204007

Time : $2\frac{1}{2}$ Hours]   [Total Marks : **70**

Instructions : (1) All questions carry equal marks
              (2) Attempt any FIVE questions.
              (3) Figures to the right indicate marks.

1   **14**

  (i)   Determine power density for a radiated power of 1000 W at distance of 20 km from an isotropic antenna.

  (ii)   What are the normal modes of radio wave propagation ? Give range of frequencies used for each mode.

  (iii) Define look angels for a satellite.

  (iv)   What will be the radio horizon of a transmitting antenna of height 100 meters?

  (v)   Write a types of digital modulations.

  (vi)   What is meant by Baud rate in digital modulation ?

  (vii) Define dynamic range for PCM.

2   **14**

  (i)   Write a mathematical expression of snell's law with statement.

  (ii)   Draw block diagram of optical fiber communication link.

  (iii) Explain why is single mode propagation impossible with graded index fiber.

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(iv) What do you mean by modes in context of wave guide? Explain TEM mode

(v) List the four primary constants of transmission line

(vi) Define transmission line. Show that it is bridge between circuit theory to electromagnetic theory.

(vii) Draw cross sections of different types of transmission line with purpose.

3   Answer the following.   14
   (1) Write a brief note on infinite transmission line with necessary expressions. Also, define secondary constants of transmission line.
   (2) Drive a transmission line equation.

4   Answer the following.   14
   (1) Explain Physics of propagation of light through optical fiber.
   (2) Write a brief note on Classification of optical fiber.

5   Answer the following.   14
   (1) Show that how a TE10 wave can be formed by superposition of two TEM waves. Prove the relation: $1/\lambda_g{}^2 = 1/\lambda^2 = 1/2a^2$ for a rectangular wave guide, where 'a' is broader dimension of rectangular waveguide.
   (2) Differentiate transmission line and wave guide. Write a note on rectangular waveguide.

6   Answer the following.   14
   (1) Write a brief note one duct propagation and tropo spheric scatter propagation in detail.
   (2) Write a note on ground wave radio propagation.

7   Answer the following.   14
   (1) Write a note on FSK- transmitter and receiver with neat diagrams.
   (2) Describe BPSK technique of digital modulation in detail.

8 Answer the following. **14**
   (1) Discuss Quaternary Phase Shift Keying (QPSK) in detail.
   (2) Derive an expression for free path loss and for a carrier frequency of 6 GHz and a distance of 50 km, determine the free space path loss.

9 Answer the following. **14**
   (1) What are the satellite orbital patterns and Write a note on geo-stationary satellite ?
   (2) Draw the internal layout of a communication satellite and explain function of each section in detail including uplink & down link models and transponder.

10 Answer the following. **14**
   (1) How the virtual height of the ionosphere is measured ? What is secant law ? Explain skip distance and service range.
       Determine maximum usable frequency for a critical frequency of 20 MHz and an angle of elevation 45°.
   (2) Explain ionospheric HF radio wave propagation hence explain the terms: Plasma and critical frequencies.

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