DR-003-1204007 Seat No. _____

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

April - 2022

ET-11 : Physics

(Electronic Communications)

Faculty Code : 003

Subject Code : 1204007

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

Instructions : (1) All questions **Q.1** to **Q.5** are compulsory.

(2) Numbers in the right margin indicate marks.

1 Answer any **Seven** : **14**

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

(b) What is "Molniya orbit" for a satellite ?

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

(d) What are the different techniques for digital modulation ?

(e) For ionospheric radio wave communication link determine maximum usable frequency for a critical frequency of 20 MHz and an angle of elevation of transmitting antemma 55^0.

(f) List and briefly describe the losses associated with fiber cables.

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

(h) What is the dominant mode in rectangular waveguide ?

(i) List the four primary constants of transmission line.

(j) Define characteristic impedance of transmission line.

2 Answer any **Two** :

(a) Derive expression for transmission path loss for propagation of electromagnetic. Wave in free space. For a carrier frequency of 6 GHz and a distance of 50 km, determine free space path loss. **07**

(b) Explain ionospheric HF radio wave propagation hence explain the terms: Plasma and critical frequencies, virtual height, skip distance, service range and secant law. **07**

(c) What is atmospheric duct radio wave communication? Discuss duct propagation and tropospheric scatter propagation in detail. **07**

3 Answer the following :

(a) Draw the internal layout of a communication satellite and explain function of each section in detail including uplink & down link models and transponder. **07**

(b) What are the satellite orbital patterns ? Write a note on geo-stationary satellite. **07**

OR

3 Answer the following :

(a) What are the types of phase shift keying ? Discuss in detail binary phase shift keying (BPSK) with necessary diagrams. **07**

(b) What is quadrature amplitude modulation (QAM)? Write a note on QAM. **07**

4 Answer any **Two** :

(a) Derive expressions for input impedance of short and open circuited transmission lines, Z_{sc} and Z_{oc}, respectively, and show that $Z_0 = \sqrt{Z_{sc} \times Z_{oc}}$ **07**

(b) 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. **07**

(c) Explain the physics of light propagation in optical fibers hence define critical angle, acceptance angle and numerical aperture. What are the light sources and detectors used in optical fiber communication ? **07**

5 Answer any **Two** :

(a) Write a note on Frequency shift keying (FSK).

(b) Write a note on Ground wave propagation.

(c) Write a note on transmission line with any termination.

(d) Write a note on Pulse code modulation.