BANKURA UNIVERSITY

B.Sc. 5th Semester (Honours) Examination, March 2021

Subject: *Electronics (H)*

Course ID: 51717 Course Code: SH/ELC/504/DSE-2(TH)

Course Title: *Transmission Lines, Antenna and Wave Propagation*

Full Marks: 25 Time: 1 Hr 15 Min

(The figures in the right hand side margin indicate marks.
Answer all the questions)

1. Answer *any three* of the following questions 1×3=3
   a) What is voltage standing wave ratio (VSWR) in connection with the transmission line when the line loss is small?
   b) What is skin depth?
   c) Write down the expression for propagation co-efficient P in terms of primary line constants.
   d) What do you mean by wave-guide?
   e) What is radio horizon?
   f) What is secant law?

2. Answer *any three* of the following questions. 2×3=6
   a) Obtain the expression for characteristics impedance Z_O in terms of primary line constants.
   b) What is the importance of wave guide propagation over plane wave propagation?
   c) Faraday's electromagnetic induction modifies which Maxwell's equation? Write down the equation before and after Faraday's modification. 1+1
   d) What is critical frequency and plasma frequency in radio wave propagation?

e) Define magnetic vector potential.

f) Write down the Maxwell's equations which are responsible for the propagation of radio-wave through a wave guide of rectangular cross-section.

3. Answer *any two* of the following questions. 5×2=10

a) Find the expression for voltage and current at any distance x from the sending end for a low frequency transmission line of finite length l which is terminated by an impedance Z_R.

b) Obtain the expression for characteristic impedance Z_o and propagation coefficient P for a high frequency transmission line.

c) Discuss briefly with sketches that ionospheric layers are formed at a certain height of the atmosphere.

d) How many sub-layers are there within the ionosphere? Name them. Which ionospheric layer produces maximum attenuation and which layer helps the radio wave propagation? 2+2+1

4. Answer *any one* of the following questions. 6×1=6

a) Obtain an expression for refractive index (μ) for an ionospheric medium with an ion concentration (N).

b) Derive an expression for RADAR range equation for a pulse RADAR system.

c) Discuss briefly the mechanism of reflection of electromagnetic wave (radio wave) in the ionosphere. In connection of radio wave propagation Maxwell formulated his famous field equation, one for the electric field E and the other for the magnetic field H which are propagated with the velocity of light (c). Write down the two equations with brief explanation. 3+3