M.Sc. PHYSICS
THIRD SEMESTER
ELECTRONICS & COMMUNICATION ENGINEERING
MPH-304 B

Duration: 3 Hrs. Marks: 70

PART : A (OBJECTIVE) = 20
PART : B (DESCRIPTIVE) = 50

[PART-B : Descriptive]

Duration: 2 Hrs. 40 Mins. Marks: 50

[Answer question no. One (1) & any four (4) from the rest]

1. Find transmission line equations for voltage and current. (5+3+2=10)
Define characteristic impedance; find the mathematical expression for it.
Write the conditions for lossless and distortionless transmission line.

2. Define unbounded and bounded media of propagation. Write different types of transmission line with diagram. (5+5=10)
An open wire transmission line has
$R=84\Omega/km,\ G=10^{-6}\ mho/km,\ L=0.01H/km,\ C=0.06\mu F/km and f=10^{3}\ Hz$
Find the characteristic impedance, propagation constant and velocity of propagation.

3. Find the greatest number of half waves of electric intensity with which it may be possible to propagate a signal of $10\ GHz$ in a waveguide whose wall separation is 0.05m. Calculate the guide wavelength for this mode of propagation. (6+4=10)
Obtain the following expression for parallel planes:
$$\frac{1}{{\lambda_0}^2}=\frac{1}{{\lambda_c}^2}+\frac{1}{{\lambda_g}^2}$$

4. Define waveguide. Discuss TE wave propagation in parallel plane waveguide. (6+4=10)
Find the expression for cut off frequency of parallel plane waveguide for TE mode.

5. What do you mean by modulation? Define various types of modulation. (2+3+5=10)
Explain mathematical analysis of AM process showing modulated carrier waves.

6. Explain transistor detection of AM signals. (5+5=10)
Discuss various techniques used in digital modulation process.

7. Write short notes on: (*any two*) (5+5=10)

i) PWM ii) ASK iii) PSK

8. Show that total power in AM wave is (4+6=10)

$$P_T = P_C\left(1+\frac{m^2}{2}\right)$$

A 10 MHz sinusoidal carrier wave of amplitude 10 mV is modulated by a 5kHz sinusoidal audio signal wave of amplitude 6mV. Find the frequency components of the resulted wave and their amplitudes.

= = * * = =

M.Sc. PHYSICS
THIRD SEMESTER
ELECTRONICS & COMMUNICATION ENGINEERING
MPH-304 B

[PART-A : Objective]

Choose the correct answer from the following : **1×20=20**

1. The characteristic impedance Z_0 of transmission line is

   a. $\sqrt{\frac{R+j\omega L}{G+j\omega C}}$ b. $\sqrt{\frac{G+j\omega C}{R+j\omega L}}$

   c. $\sqrt{\frac{G-j\omega C}{R+j\omega L}}$ d. $\sqrt{\frac{G-\omega C}{R+\omega L}}$

2. For lossless transmission line, which statement is correct?

   a. $R=0, G=0$ b. $R\neq 0, G=0$

   c. $R=0, G\neq 0$ d. $R\neq 0, G\neq 0$

3. For TE wave:

   a. $E_z=0$ b. $E_z\neq 0$

   c. $H_z=0$ d. $H_z\neq 0$

4. Velocity of wave in free space is:

   a. $\frac{1}{\sqrt{\mu\varepsilon}}$ b. $\sqrt{\mu\varepsilon}$

   c. $\frac{1}{\sqrt{\mu_0\varepsilon_0}}$ d. $\sqrt{\mu_0\varepsilon_0}$

5. Critical frequency for parallel plane is:

   a. $f_c=\frac{m}{2a\sqrt{\mu\varepsilon}}$ b. $f_c=\frac{m}{a\sqrt{\mu\varepsilon}}$

   c. $f_c=\frac{1}{2a\sqrt{\mu\varepsilon}}$ d. $f_c=\frac{a}{2m\sqrt{\mu\varepsilon}}$

6. Which of the following statements are true for a transmission line parameters R, L, G and C?

   a. R and L are series elements.

   b. G and C are shunt elements.

   c. Both R and G depend on conductivity of the conductors forming the line.

   d. Only R depends explicitly on frequency.

7. Process of recovering AF signal from the modulated carrier wave is known as:

   a. demodulation

   b. modulation

   c. rectification

   d. amplification

8. The main purpose of modulation is to:

   a. combine two waves of different frequencies.

   b. achieve wave shaping of the carrier.

   c. transmit low frequency information over distances efficiently.

   d. produce sidebands.

9. 100% modulation is produced in AM when carrier:

   a. frequency equals signal frequency.

   b. frequency exceeds signal frequency.

   c. amplitude equals signal frequency.

   d. amplitude exceeds signal frequency.

10. In an AM wave with 100% modulation, each sideband carries.....of the total transmitted power.

    a. one-half b. one-sixth

    c. one-third d. two-third

11. VSWR stands for:

    a. ratio of voltage wave.

    b. ratio of current wave.

    c. ratio of amplitude wave.

    d. ratio of frequency wave.

12. In PAM process:

    a. width of the pulse is varied.

    b. frequency of the pulse is varied.

    c. amplitude of the pulse is varied.

    d. none of the above.

13. Modulation may be defined as:

    a. $m=\frac{E_c(\max.)-E_c(\min.)}{E_c(\max.)+E_c(\min.)}\times 100$

    b. $m=\frac{E_c(\max.)+E_c(\min.)}{E_c(\max.)-E_c(\min.)}\times 100$

    c. $m=\frac{E_c(\max.)+E_c(\min.)}{E_c(\max.)+E_c(\min.)}\times 100$

    d. $m=\frac{E_c(\max.)-E_c(\min.)}{E_c(\max.)-E_c(\min.)}\times 100$

14. In AM, $\frac{mA}{2}\cos 2\pi(f_c + f_m)$ is the:
   a. lower side frequency
   b. upper side frequency
   c. carrier frequency
   d. modulated frequency

15. In ASK or PSK detector consists of:
   a. multiplier, integrator, decision device.
   b. multiplier, integrator.
   c. integrator, decision device.
   d. none of the above.

16. Wave guiding systems can be dived as:
   a. transmission line
   b. wave guides
   c. both a) and b)
   d. none of the above

17. Wave propagation is divided into:
   a. unbounded media propagation.
   b. bounded media or guided wave propagation.
   c. both a) and b).
   d. nine of the above.

18. Relation between λ_0, λ_g and λ_c is:
   a. $\frac{1}{{\lambda_0}^2} = \frac{1}{{\lambda_c}^2} - \frac{1}{{\lambda_g}^2}$
   b. $\frac{1}{{\lambda_0}^2} = \frac{1}{{\lambda_c}^2} + \frac{1}{{\lambda_g}^2}$
   c. $\frac{1}{{\lambda_c}^2} = \frac{1}{{\lambda_0}^2} + \frac{1}{{\lambda_g}^2}$
   d. $\frac{1}{{\lambda_g}^2} = \frac{1}{{\lambda_c}^2} + \frac{1}{{\lambda_0}^2}$

19. Total power in AM wave is:
   a. $P_T = P_C\left(1 - \frac{m^2}{2}\right)$
   b. $P_T = P_C\left(1 + \frac{m^2}{2}\right)$
   c. $P_T = P_C\left(1 + \frac{m^2}{4}\right)$
   d. $P_T = P_C\left(1 - \frac{m^2}{4}\right)$

20. DSB-SC stands for:
   a. double sideband superposed carrier.
   b. double sideband single carrier.
   c. dual sideband suppressed carrier.
   d. double sideband suppressed carrier.

= = * * = =

UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

[PART (A) : OBJECTIVE]

Duration : 20 Minutes

Serial no. of the main Answer sheet

Course : .....

Semester : ..... **Roll No :** .....

Enrollment No : ..... **Course code :** .....

Course Title : .....

Session : 2017-18 **Date :** .....

****

Instructions / Guidelines

- The paper contains twenty (20) / ten (10) questions.
- Students shall tick (✓) the correct answer.
- No marks shall be given for overwrite / erasing.
- Students have to submit the Objective Part (Part-A) to the invigilator just after completion of the allotted time from the starting of examination.

Full Marks	Marks Obtained
20	

Scrutinizer's Signature *Examiner's Signature* *Invigilator's Signature*