NS – 349

V Semester B.Sc. Examination, November/December 2016
(Semester Scheme) (CBCS) (2016-17 and Onwards) (Fresh)
ELECTRONICS – V
EL 501 : Communication – I

Time : 3 Hours | Max. Marks : 70

Instructions : *Answer **all** the questions from Part – **A**, **any five** questions from Part – **B** and **any four** questions from Part – **C**.*

Note : *Answer **all** the questions of Part – **A** in **any one** page, the **same** question answered multiple times will **not** be considered for evaluation.*

PART – A

1. Answer **all** the sub-divisions : **(15×1=15)**

i) The signal to noise ratio of an ideal amplier is

a) 1 b) 0 c) ∞ d) None

ii) The value of the resistor creating thermal noise is doubled, the noise power generated is

a) Halved b) Quadrupled c) Doubled d) Unchanged

iii) The characteristic impedance of a transmission line is given by

a) $Z_0 = \sqrt{X/Y}$ b) $Z_0 = \sqrt{X \cdot Y}$ c) $Z_0 = X \cdot Y$ d) $Z_0 = X/Y$

iv) As the modulation index is increased, the carrier power

a) Increases b) Remains same

c) Decreases d) None

v) In frequency modulation, theoretical value of the bandwidth is

a) $2 f_m$ b) $2 f_c$ c) $(f_c + f_m)$ d) Infinity

vi) In SSB transmission

a) The bandwidth reduces to half

b) The bandwidth doubles

c) The carrier alone is removed

d) None of the above

P.T.O.

vii) The image frequency corresponding to a signal frequency (f_s) in a super heterodyne AM receiver is

a) $f_s + f_i$ b) $f_s + 2f_i$ c) $f_s - f_i$ d) $f_s - 2f_i$

viii) A tuned amplifier with high Q will have high

a) Selectivity b) Sensitivity

c) Fidelity d) Frequency

ix) In an FM-transmitter the pre-emphasis is used

a) After demodulation

b) Prior to modulation

c) To increase the amplitude of low frequency components of the signal

d) To decrease the amplitude of high frequency components of the signal

x) A dipole antenna with a radiation resistance of 2Ω carries rms current of 30A. What would be the power radiated by the antenna ?

a) 18 kw b) 6 kw c) 1.8 kw d) 180 kw

xi) The input impedance of a folded dipole is _____ times greater than that of a single radiator.

a) 4 times b) 2 times

c) 3 times d) 6 times

xii) A helical antenna gives _____ polarization.

a) Horizontal b) Vertical

c) Circular d) None

xiii) In TV transmission system, which type of modulation is used for transmitting video signals.

a) Amplitude b) Frequency

c) Phase d) None

xiv) For an interlaced ratio 2 : 1, the number of lines per field in the America's TV system is

a) 525 b) 30 c) 60 d) 262½

xv) In a colour TV, the combination of Red and Green Yields

a) Blue b) Magenta

c) Cyan d) Yellow

PART – B

Answer **any five** questions : **(5×7=35)**

2. a) What is internal noise ? Explain thermal agitation noise and transit time noise.
   b) Define the terms reflection coefficient and voltage standing wave ratio w.r.t. transmission line. **(5+2)**
3. a) Explain the propagation of electromagnetic waves as ground waves.
   b) Draw the circuit diagram of AM-Collector modulator, explain its working. **(3+4)**
4. Derive an expression for the instantaneous voltage of an amplitude modulated wave and draw its frequency spectrum. **7**
5. With a circuit diagram, explain the working of a linear diode detector showing the waveforms at each stage. Mention its limitations. **7**
6. a) Define the terms sensitivity and selectivity with respect to a radio receiver.
   b) Draw the block diagram of FM receiver, explain the function of each block. **7**
7. Considering the expression for electric field intensity, derive an expression for the power radiated by a short dipole antenna and also find its radiation resistance. **7**
8. a) What is resonant antenna ? Draw the radiation pattern of a resonant antenna of length $l = \lambda/2$, $l = \lambda$ and $l = 3\lambda/2$.
   b) Mention any three differences between European and American TV Standards. **(4+3)**
9. Draw the Schematic diagram of a Vidicon Camera tube and explain its working. **7**

PART – C

Answer **any four** questions : **(4×5=20)**

10. Two resistors 100 KΩ and 150 KΩ are connected in parallel, they are maintained at 27°C and the bandwidth is 200 KHz,
    i) Calculate the thermal noise voltage.
    ii) If the bandwidth is doubled, what happens to the noise voltage? Calculate its value. [K = 1.38×10^{-23} (Boltzmann Constant)]. **5**

11. Calculate the power of the carrier and each side bands for an AM signal having 80% modulation and total power of 8 Kwatts. 5

12. In a frequency modulator the frequency (f_m) is 600 Hz, modulating voltage is 3V and modulation index is 12. What is the modulation index if
    i) f_m is increased to 800 Hz and V_m is decreased to 2V ?
    ii) f_m is decreased to 400 Hz and V_m is increased to 5V ? 5

13. Draw the block diagram of AM-Super heterodyne receiver. Mention the functions of each block. 5

14. A horizontal antenna of length 2 m has a current of 5 A flowing through it. If the frequency of the signal is 12 MHz, calculate
    i) Radiation resistance
    ii) Radiation efficiency
    iii) Total power radiated, if the loss resistance of the antenna is 10 Ω. 5

15. Calculate the horizontal and vertical scanning frequencies of interlaced scanning in the following system :
    i) 525 lines and 30 frames/sec.
    ii) 625 lines and 25 pictures/sec. 5