M.Sc. 3rd Semester Examination, 2022

ELECTRONICS

(*Communication Systems and Networkings*)

PAPER – ELC-302

Full Marks : 50

Time : 3 hours

Answer any **four** questions each from Group-A and Group-B and **two** questions from Group-C

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP – A

Answer any **four** questions : 2×4

1. Prove that $P_t = P_c \left(1 + \frac{m^2}{2} \right)$, where m is the modulation index of an AM signal, P_c is the carrier power and P_t is the total power of an AM wave.   2

2. What do you mean by VSB amplitude modulation ? Mention its uses.   1 + 1

3. How can you demodulate an FM signal using PLL ? 2

4. What are pre-emphasis and de-emphasis of FM signals ?   1 + 1

5. State and explain the Nyquist sampling theorem. 2

6. Write down some advantages of digital communication over analog communication.   2

GROUP – B

Answer any **four** questions :   4 × 4

7. An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation.
$\phi_{EM}(t) = 10 \cos \{\omega_c t + 5\sin 3000t + 10 \sin 2000 \pi t\}$
Find the power of the modulated signal, the frequency deviation Δf, the deviation ratio β and estimate the band width of $\phi_{EM}(t)$.   1 + 1 + 1 + 1

8. Discuss T1 time division multiplexing system in connection with PCM.   4

9. Explain with suitable diagram the phase-shift method for SSB generation. What is Weaver's method for SSB generation ? 2 + 2

10. Discuss, with proper block diagram the Armstrong method of wide band FM generation. 4

11. Explain the principle of operation of trectifier detector. Determine η and the percentage of the total power carried by the side bands of the AM wave for tone modulation when $\mu = 0.5$ and 0.3.
2 + 2

12. What is non uniform quantization ? What do you mean by companding ? What is digit interleaving and word interleaving ? 1 + 1 + 2

GROUP – C

Answer any **two** questions : 8 × 2

13. With a neat sketch explain how a superheterodyne receiver works. What is image frequency ? How can it be supressed in a super hetero dyne receiver ? Draw and explain the block diagram of a super-*heterodyne* receiver for FM system. 4 + 1 + 1 + 2

14. Explain with a neat diagram how a DSB-SC AM wave can be generated using a bridge circuit. What is ring modulator ? What is frequency converter ?

4 + 2 + 2

15. Prove the Nyquist sampling theorem. State the interpolation formula for signal reconstruction. Write down the difference between TDM and TDMA.

4 + 2 + 2

16. How can you demodulate FM signal using slope detection method ? Show that distortion arised from nonlinearily is less in FM in comparison with AM waves. Write down the carson's rule for FM band width calculation.

3 + 3 + 2

[*Internal Assessment* — 10 Marks]