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S – 6826

Reg. No. :

Name :

Third Semester M.Sc. Degree Examination, February 2024

Physics

Special Paper 1

PH 233 E : ADVANCED ELECTRONICS I

(2020 Admission Onwards)

Time : 3 Hours

Max. Marks : 75

SECTION – A

(Answer **any five** questions. Each question carries **3** marks)

1. What are the applications of PAM?
2. Draw the waveforms of AM signal and Single Side Band-suppressed carrier (SSB-SC) signal.
3. Briefly describe the sensitivity, selectivity fidelity and noise figure with reference to communication broadcast receiver.
4. What is an image frequency? How is image frequency rejection achieved?
5. What is Shannon-Hartley theorem? Discuss the fundamental importance of the theorem.
6. Distinguish between cell splitting and cell sectoring.
7. "Pulse modulation systems are not digital, whereas pulse code modulation is". Justify.
8. What are the advantages of microwave communications?

(5 × 3 = 15 Marks)

P.T.O.



SECTION – B

(Answer **three** questions. Each question carries **15** marks)

9. (a) What are the advantages of single sideband transmission?
- (b) (i) Discuss in detail about Double Side Band – Suppressed Carrier system (DSB-SC).
- (ii) Explain the operation of DSB balanced modulator with neat diagram.

OR

10. (a) With the help of block diagrams, describe the functional aspects of an FM broadcast communication receiver clearly bringing out the significance of each building block.
- (b) Discuss the direct and indirect methods of generating FM signals.
11. (a) Explain the three methods used for synchronization in digital modulation schemes.
- (b) Compare and contrast the three digital modulation schemes, ASK, PSK and FSK. Also briefly discuss the bandwidth and power requirements of binary ASK, PSK and FSK schemes.

OR

12. (a) Give an overview on the optical communication system and its components.
- (b) What are optical solitons? Briefly explain the soliton based optical communication systems.
13. (a) What is Z-transform? Explain the properties of Z-transform.
- (b) Find the Z-transform of function defined by $x(n) = na^n u(n)$.

OR

14. (a) Define Fourier transform. State and prove the properties of Fourier transform.

(b) Using Parseval's identity evaluate $\int_0^{\infty} \frac{x^2 dx}{(x^2 + a^2)^2}$.

(3 × 15 = 45 Marks)



SECTION – C

(Answer any **three** questions. Each question carries **5** marks)

15. A 20 MHz carrier is frequency modulated by a sinusoidal signal such that the peak frequency deviation is 100 kHz. Determine the modulation index and the approximate bandwidth of the FM signal if the frequency of the modulating signal is (a) 1 kHz; (b) 50 kHz and (c) 500 kHz.
16. With the help of suitable block diagram, explain the modular TDM-PCM telephone system.
17. Find the inverse Z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$.
18. Binary data has to be transmitted over a telephone link that has a usable bandwidth of 3000 Hz and a maximum achievable signal-to-noise power ratio of 6 dB at its output. (a) Determine the maximum signaling rate and probability of error in terms of average signal power, if a coherent ASK scheme is used for transmitting binary data through this channel. (b) If the data rate is maintained at 300 bits/sec, calculate the error probability.
19. Find the Fourier series expansion of the even periodic extension of $f(t) = t^2$, $-\pi < t < \pi$. Assume the expansion: $t = 2 \sum_{n=1}^{\infty} \frac{(1)^{n-1}}{n} \sin nt$.
20. Explain Pulse code Modulation. Draw one complete cycle of some irregular waveform and show how it is quantized, using eight standard levels?

(3 × 5 = 15 Marks)

