



**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2022

**ELSADSE06T-ELECTRONICS (DSE3/4)**

Time Allotted: 2 Hours

Full Marks: 40

*The figures in the margin indicate full marks.  
Candidates should answer in their own words and adhere to the word limit as practicable.*

**GROUP-A**

1. Answer any **five** questions from the following: 2×5 = 10
- (a) State Parseval's energy theorem.
  - (b) What is the utility of FFT?
  - (c) What is aliasing effect?
  - (d) What is the condition to be satisfied for a discrete-time sinusoidal sequence to be periodic?
  - (e) Write the properties of a unit impulse function.
  - (f) What are recursive and non-recursive difference systems? How are they related to FIR and IIR System?
  - (g) What is meant by ROC? What should be ROC for a casual system?
  - (h) What is the relation between DTFT and DFT?

**GROUP-B**

**Answer any six questions from the following**

5×6 = 30

2. (a) Establish the relation between DFT and Z-transform. 2+(2+1)  
(b) What is 'Warping effect' with respect to realization of digital filters? How can it be avoided?
3. Determine the system function of a discrete-time system described by the difference equation 5
- $$y(n) - y(n-1) + 0.8y(n-2) = x(n) + x(n-2)$$
- Plot the pole-zero and determine whether the system is stable or not.
4. Using properties of DTFT, find 2 $\frac{1}{2}$ +2 $\frac{1}{2}$
- (a)  $\left(\frac{1}{4}\right)^{|n-2|}$
  - (b)  $7u(n-1) - 7u(n-9)$

5. (a) Check whether the following signal is periodic and if so, find the time period. 2+3

$$y(n) = \cos\left(\frac{n\pi}{3}\right) + \cos\left(\frac{3\pi n}{4}\right)$$

- (b) Prove that for a casual sequence, the ROC is the exterior of a circle of radius  $r$ .

6. Compare IIR and FIR filters. 5

7. Find the linearity, invariance and casualty of the system given by 5

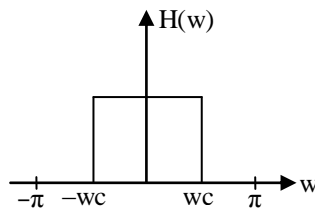
$$y(n) = -ax(n-1) + x(n)$$

8. (a) Draw the butterfly operation in DIT and DIF algorithm. 4+1

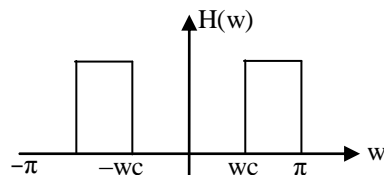
- (b) State one advantage of DFT over DTFT.

9. Determine the impulse response of the given filters.

- (a)



- (b)



10. Distinguish between:  $2\frac{1}{2} + 2\frac{1}{2}$

- (a) Casual and Non-casual system  
(b) Stable and unstable system.

- 11.(a) Using final value theorem, find  $x(\infty)$  if  $x(z)$  is given by 3+2

$$x(z) = \frac{2z + 3}{(z + 1)(z + 3)(z - 1)}$$

- (b) Find the input signal  $x(n)$  that will generate  $y(n) = \{1, 1, 2, 0, 2, 1\}$  for a system with impulse response  $h(n) = \{1, -1, 1\}$ .

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**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2022

**ELSADSE05T-ELECTRONICS (DSE3/4)**

Time Allotted: 2 Hours

Full Marks: 40

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All symbols are of usual significance.*

**GROUP-A**

1. Answer any *five* questions from the following: 2×5 = 10
- (a) What are the advantages of 'Switch' over 'Hub'? 2
  - (b) What do you mean by ARQ? Explain. 2
  - (c) Explain the concept of subnet. 2
  - (d) What are the different types of classes in IPV4 addressing? 2
  - (e) What do you understand by multicast routing? 2
  - (f) What is a domain name? Name one guided medium that is immune to electromagnetic interference. 1+1
  - (g) What do you mean by packet switching? How does it differs from circuit switching? 1+1
  - (h) What is the difference between congestion control and flow control? 2

**GROUP-B**

**Answer any six questions from the following** 5×6 = 30

2. Write a short note on a digital-to-digital encoding system of your choice. 5
3. Explain the bus topology and ring type topology network. Compare their performance. 3+2
4. What is FDDI? How can you design a LAN based on FDDI? 1+4
5. Write short notes on the following protocols: 2½+2½
- (a) ARP
  - (b) ICMP.

- |     |  |     |
|-----|--|-----|
| 6.  | What are the source of errors in data communication? What are general principle of error detection and correction? | 2+3 |
| 7.  | (a) What are the differences between Host-to-Host and Process-to-Process delivery?<br>(b) What do you mean by QoS? | 4+1 |
| 8.  | Describe in brief the sliding window protocol.   | 5   |
| 9.  | How Shannon's theorem corrects the Nyquist theorem? Explain in brief.  | 5   |
| 10. | With a neat diagram, explain OSI reference model.  | 5   |
| 11. | (a) How domain name system translates between URL and IP addresses?<br>(b) What is a datagram?                     | 3+2 |

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**WEST BENGAL STATE UNIVERSITY**

B.Sc. Honours 6th Semester Examination, 2022

**ELSADSE04T-ELECTRONICS (DSE3/4)**

Time Allotted: 2 Hours

Full Marks: 40

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**GROUP-A**

1. Answer any **five** questions from the following: 2×5 = 10
- (a) How the light gets guided in optical fiber?
  - (b) Why passive optical detectors like LDRs are not suitable for optical fiber communication?
  - (c) Distinguish between co-channel interference and adjacent channel interference.
  - (d) Write one advantage and one limitation of Delta Modulation over DPCM.
  - (e) What do you mean by intermodal and intramodal dispersions?
  - (f) What is the frequency range of C-band?
  - (g) What is Ethernet-mobile IP?
  - (h) What is QAM and also mention its limitation?

**GROUP-B**

**Answer any six questions from the following**

5×6 = 30

2. (a) With a neat block diagram, explain an optical fiber communication system. 3+2  
(b) What do you mean by graded index fiber?
3. Draw the simplest block diagram of a C-band satellite transponder and explain the function of each block. 2+3
4. (a) Which type of dispersion of optical fiber depends on the material of the fiber? 1+4  
(b) Consider a step index multimode fiber having core diameter of 500  $\mu\text{m}$ , cladding diameter of 125  $\mu\text{m}$ ,  $n_1 = 1.47$  and  $\Delta = 1.5\%$ . Calculate the modal dispersion for this fiber at  $\lambda = 850 \text{ nm}$ , where the symbols have their usual significance.

5. (a) What are the conditions of orthogonality in a Quadrature Amplitude Modulation (QAM) system?  $2\frac{1}{2}+2\frac{1}{2}$
- (b) How the property of orthogonality can be used to separate signals in a QAM demodulator?
6. (a) A delta modulation system with sampling frequency 256 kHz and the voice bandwidth of 3.4 kHz, is transmitting a voice signal of maximum amplitude 10 volts. Determine the average power of the granular noise and minimum channel bandwidth in bits/sec. (1+1)+3
- (b) Explain the working of an ADM receiver with necessary diagram.
7. (a) What is ARFCN? 1+2+2
- (b) Why data encryption is essential in wireless digital communication?
- (c) Why cellular mobile communication is named so?
8. (a) Explain the different types of transmission losses in satellite communication with necessary expressions. Hence write the link power budget equation. 3+2
- (b) Explain the term 'Sun Transit Outrage'.
9. Explain the terms and their importance in cellular communication system:  
(i) IMEI and (ii) HLR
10. Which type of satellite orbits would you prefer for telephony and broadcast operations? Please explain your answer.

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**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2022

**ELSACOR13T-(CC13)**

**ELECTRONICS**

Time Allotted: 2 Hours

Full Marks: 40

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**GROUP-A**

**Answer any five questions from the following**

2×5 = 10

1. What is a channel in communication system? Give two examples.
2. Define modulation index. How it can be measured in amplitude modulation?
3. In a typical communication system, the SNR at the input and output are 5:2 and 5:4 respectively. Compute Noise Figure of the system.
4. State the main advantage and disadvantage of low level modulation.
5. “FM and PM are not only very similar but are inseparable.” — Discuss.
6. In frequency modulation, if the frequency of the modulating voltage is doubled, compute the change in the ‘rate of deviation of carrier’ frequency.
7. What is Nyquist rate? State sampling theorem in this regard.
8. In a PCM system, signal is sampled at a rate of  $fs$  and number of pulses in one code group is  $p$ . Compute the number of pulses per second.

**GROUP-B**

**Answer any six questions from the following**

5×6 = 30

9. (a) Distinguish between DSBSC and DSBTC in amplitude modulation with proper diagram. 3+2  
(b) How rectifier detection method is used for amplitude demodulation?

10. Describe the operation of PLL as FM demodulator with neat diagram and relevant waveforms.
11. What is Bit rate? What is Baud Rate? What is M-ary coding? What is the main advantage of the M-ary coding? 1+1+2+1
12. A certain transmitter radiates 9 kW with the carrier unmodulated and 10.125 kW when the carrier is sinusoidally modulated. Calculate the modulation index. If another sine wave corresponding to 40% modulation is transmitted simultaneously, determine the total radiated power. 5
13. Describe PCM technique with diagram and relevant waveforms.
14. Write short notes on ASK or FSK with relevant diagram and waveforms.
15. Write short notes on PAM or PPM.
16. Bandwidth of the input to a pulse code modulator is restricted to 4 kHz. The signal varies from  $-3.8$  V to  $+3.8$  V and has the average power of 30 MW. The required signal to - quantization noise power ratio is 20 dB. The modulator produces binary output.
- (a) Find the number of bits required per sec.
- (b) Output of 30 such PCM codes are time multiplexed. What is the minimum required transmission bandwidth for the multiplexed signal?
17. Explain the working of a diode detector with the help of a circuit diagram.

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**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Honours 6th Semester Examination, 2022

**ELSACOR14T-ELECTRONICS (CC14)**

**PHOTONICS**

Time Allotted: 2 Hours

Full Marks: 40

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**GROUP-A**

**Answer any *five* questions from the following**

**2×5 = 10**

1. State Brewster's Law.
2. What do you mean by coherent light source?
3. Why light emitted by two candles cannot produce interference pattern?
4. What is division of wavefront? What is division of amplitude?
5. What is the line-shape function for LASER?
6. Why direct band-gap materials are preferred for optoelectronic devices?
7. Define acceptance angle and numerical aperture of a step index optical fiber.
8. With schematic figures, show the differences between step-index and graded-index optical fiber.

**GROUP-B**

**Answer any *six* questions from the following**

**5×6 = 30**

9. Derive an expression for wavelength of monochromatic light source used in Newton's ring experiment in terms of diameters of rings and radius of curvature of the lens used.

10. Discuss the phenomenon of Fraunhofer diffraction at a single slit and show that the intensities of successive maxima are nearly in the ratio  $1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2}$  .
- 11.(a) Define optic axis and principal section of a crystal. 2+2+1  
(b) What do you mean by positive and negative crystals?  
(c) Give one example of each.
- 12.(a) What are the differences between interference and diffraction of light? 2+3  
(b) In a zone plate, the index of first half period zone is 0.06 cm. A parallel beam of light of wavelength  $6000\text{\AA}$  fall on the plate. Find the distance of the first focus.
13. Briefly explain the working principle of LED. Compare LED with p-n junction LASER. 4+1
14. Give the construction and theory of (i) a quarter-wave plate and (ii) half-wave plate.
15. Explain the principles of operation of photo-transistor.
16. What is dispersion with respect to fiber optic communication?
17. What is liquid crystal? Why is it so called? How the LCD display works? 1+1+3
18. With suitable diagrams, explain the operation of p-i-n diode as light detector.

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**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Programme 6th Semester Examination, 2022

**ELSGDSE03T-ELECTRONICS (DSE2)**

Time Allotted: 2 Hours

Full Marks: 40

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**GROUP-A**

**Answer any five questions**

2×5 = 10

1. (a) What is impact ionization?
- (b) Why 'LASER' is called so? Explain its nomenclature.
- (c) How one can turn-off an SCR?
- (d) What are the relative advantages and disadvantages of an LCD display as compared to an LED display?
- (e) What is "Population inversion" for a LASER?
- (f) State some applications of PIN 'photodiode'.
- (g) What are the different loss-mechanisms for optical fiber communication?
- (h) "Solar cells have a negative short circuit current ( $I_{sc}$ )"— Explain.

**GROUP-B**

**Answer any six questions**

5×6 = 30

2. Describe the operation of SCR, considering the two-transistor model. 5
3. (a) Explain the operation of photo voltaic cell. 3
- (b) What are the different layers of a solar cell? 2
4. (a) What are the basic condition of 'LASER' emission? 2
- (b) Explain the operation of a LASER. 3
- 5.(a) What is electro-optic effect? 3
- (b) How the shape of 'LED' enhances the efficiency of the device? 2
6. What is the effect of "Numerical Aperture"? Derive the expression of "Numerical Aperture". 2+3

7. (a) Why the use of optical fiber is so popular now? 2  
(b) What are the advanced use of LEDs ? 3
8. Explain the construction and working principle of a TRIAC. Draw the I-V characteristics of the device. (1+3)+1
9. A typical LED couples 1.8 mW optical power into an optical fiber, when the drive current is 20 mA. Determine the overall power conversion efficiency when the forward voltage across the diode is 2V. 5
- 10.(a) Why the requirements of power electronics devices are increasing? 2  
(b) Why the negative resistance regions are important in some semiconductor devices? 3

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**WEST BENGAL STATE UNIVERSITY**  
B.Sc. Programme 6th Semester Examination, 2022

**ELSGDSE04T-ELECTRONICS (DSE2)**

**ELECTRONIC INSTRUMENTATION**

Time Allotted: 2 Hours

Full Marks: 40

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**GROUP-A**

**Answer any five questions from the following**

2×5 = 10

1. What are the advantages of digital voltmeter over analog voltmeter?
2. What do you mean by accuracy of an instrument?
3. What do you mean by electromagnetic interference?
4. Draw circuit for a 5 V regulated power supply using IC 7805.
5. Two power supplies A and B both have no load voltage (open circuit voltage) 12 V. For maximum load, they provide output voltages as 11.5 V and 11.8 V respectively. Explain, which power is better.
6. What do you mean by transducer? Give two examples.
7. Why, short circuit protection is required in power supply?
8. State importance of oscilloscope in electronic measurement.
9. How do you approach to measure a very high (of the order of MΩ) unknown resistance?

**GROUP-B**

**Answer any six questions**

5×6 = 30

10. With schematic diagrams, describe, how to measure current.

11. Two sinusoidal signals are only differed by a constant phase angle. Describe, how do you measure the phase difference using CRO.
- 12.(a) What is 10:1 probe of CRO? 2+2+1  
(b) State the difference between dual beam CRO and dual trace CRO.  
(c) A sine-wave signal is observed on CRO. The peak-to-peak voltage of the signal is found to be 80 mV. Calculate the RMS of the signal.
13. Describe Anderson bridge to measure an unknown inductance. 5
14. What is the main application of LVDT? Describe the operation of LVDT. 1+4
15. Compare between active and passive transducers. Describe the operation of photovoltaic cell as a light detecting transducer. 2+3
16. With neat diagram, explain the working of a power supply.
17. Explain the operation of a capacitive transducer.
18. Describe the measurement of temperature using RTD.

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