

**FOURTH SEMESTER M.Sc. DEGREE (SUPPLEMENTARY) EXAMINATION  
APRIL 2022**

(CUCSS)

Electronics

TE4E03—TELEMATICS

(2010 to 2018 Admissions)

Time : Three Hours

Maximum : 36 Weightage

**Part A**

*Answer all questions.*

*Each question carries 1 weightage.*

1. Explain analog twisted pair loop as subscriber loop.
2. What is ISDN ? What are its advantages ?
3. What is meant by inter-exchange signalling ? What are the different types ?
4. What are the differences between ISDN and ATM ?
5. What is meant by a switched network ? Explain with a schematic diagram.
6. What is cross point complexity in a recursively constructed non-blocking network ? Calculate the cross point complexity of a  $100 \times 100$  point recursively rearrangeably non- blocking network.
7. Explain the performance measures of routing.
8. Explain a Clos network with a block diagram.
9. Write short notes on TST switches.
10. What are the limitations of a cross bar switch ? How can these problems be overcome ?
11. What is the purpose of dynamic routing ? What are its advantages ?
12. Explain the signalling in a local telephone exchange.
13. Explain time switching with an example.
14. State and explain Clos Theorem.

(14 × 1 = 14 weightage)

**Turn over**

**Part B**

*Answer any seven questions.*

*Each question carries 2 weightage.*

15. Draw and explain the functional architecture of BISDN.
16. Explain the circuit switching in a telephone network with a schematic diagram. What are the different steps in circuit switching? Explain.
17. Explain ATM virtual connections.
18. Explain the concept of alternate routing.
19. Explain in-channel signalling and common-channel signalling.
20. Explain Equivalent Random Theory method to estimate the traffic blocking.
21. Model a traffic process in telephone network and derive the blocking probability and utilization.
22. Explain a 3-stage Clos network with a schematic block diagram.
23. State and prove Slepian Duguid theorem.
24. Explain blocking, strictly nonblocking and rearrangeably non-blocking switching network. How these conditions are achieved?

(7 × 2 = 14 weightage)

**Part C**

*Answer any two questions.*

*Each question carries 4 weightage.*

25. Explain the call processing in a telephone network. What is the role of switches in call processing? Explain.
26. Explain the Jacobaeus method for alternate path routing using a three stage Clos network.
27. Draw a 4 × 4 crossbar network. Explain the mechanism to be used for controlling the individual crosspoints.
28. Explain the cost criteria for switching.

(2 × 4 = 8 weightage)

FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022

(CBCSS)

Electronics

ELS4E03E—ADVANCED SENSORS

(2020 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

1. *In cases where choices are provided, students can attend all questions in each section.*
2. *The minimum number of questions to be attended from the Section / Part shall remain the same.*
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**Part A**

*Answer any four questions.*

*Each question carries 2 weightage.*

1. What are the different parts of an inductance transducer ? Explain with a diagram.
2. Explain the working principle of resistive transducers.
3. Write short notes on photovoltaic cells.
4. What is a smart sensor ? How does it work ? List the applications.
5. Explain the solar irradiation measurement using pyranometer.
6. What are the characteristics of radiation sensors ? Explain.
7. Explain the IEEE 1451.4 communication standard for smart sensor interface.

(4 × 2 = 8 weightage)

**Part B**

*Answer any four questions.*

*Each question carries 3 weightage.*

8. Explain the principle of the basic capacitance transducer.
9. Explain the construction and working of semiconductor strain gauge with neat diagram.
10. Explain how the wind speed is measured using anemometer.
11. Explain the role of sensors in home appliances with a specific example.
12. Explain a microwave sensing system with a neat block diagram. What are the applications of microwave sensors ?
13. Write a note on vision sensors.
14. What is meant by thermoelectric effect ? Explain any one transducer that is based on this.

(4 × 3 = 12 weightage)

**Part C**

*Answer any two questions.*

*Each question carries 5 weightage.*

15. Explain the various types of temperature transducers.
16. Explain the odour and taste sensing in the food processing industry.
17. Explain the different sensors and their functions used in automobiles.
18. Explain the construction and the working principle of intrinsic and extrinsic fiber optic sensors.

(2 × 5 = 10 weightage)

**FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022**

**April 2021 Session for SDE/Private Students**

(CBCSS)

Electronics

ELS 4E 03 D—MICROWAVE ELECTRONICS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

**Covid Instructions are not applicable for Pvt/SDE students (April 2021 session)**

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**Part A**

*Answer any four questions.*

*Each question carries 2 weightage.*

1. List any four applications of microwaves.
2. Define cutoff wavelength of a rectangular waveguide.
3. Define characteristic impedance of a transmission line.
4. Why impedance matching is required ?
5. List the important advantages and disadvantages of IMPATT diode.

**Turn over**

6. Define half power beamwidth.
7. Define radiation intensity of an antenna.

(4 × 2 = 8 weightage)

### Part B

*Answer any four questions.*

*Each question carries 3 weightage.*

8. Explain group velocity and phase velocity of a waveguide.
9. Write a note on scattering parameters.
10. What is a transmission line ? What are different types of transmission lines commonly used ?
11. With a sketch, explain the difference between standing waves and travelling waves.
12. Explain the construction and working principle of varactor diode.
13. Write the advantages and disadvantages of a microstrip antenna.
14. How microwave measurements differ from low frequency measurements ?

(4 × 3 = 12 weightage)

### Part C

*Answer any two questions.*

*Each question carries 5 weightage.*

15. How are waveguides different from normal two wire transmission lines ? Discuss the similarities and dissimilarities.
16. A lossless transmission line with  $Z_0 = 50 \Omega$  is 30 m long and operates at 2 MHz. The line is terminated with a load  $Z_L = 60 + j40 \Omega$ . If wave velocity,  $u = 0.6c$  on the line.

Find :

- (a) The reflection co-efficient.
  - (b) The standing wave ratio.
  - (c) The input impedance.
17. Explain Gunn Effect. Why are Gunn devices called diode ? Give the types of materials used for Gunn diode.
  18. List and explain important parameters of antenna.

(2 × 5 = 10 weightage)

**FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022**

**April 2021 Session for SDE/Private Students**

(CBCSS)

Electronics

ELS 4E 03 A—MEMS AND NEMS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

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**Section A**

*Answer any four questions.*

*Each question carries 2 weightage.*

1. What are the materials used in MEMS technology ?
2. Explain dry and wet etching.
3. Explain about MEMS sensors.
4. Explain torsion bar actuators.
5. Explain vibratory gyroscope.

**Turn over**

6. What are the principles behind the actuation using thermal forces ?
7. What are the different applications of comb drive devices ?

(4 × 2 = 8 weightage)

### Section B

*Answer any four questions.*

*Each question carries 3 weightage.*

8. What are the different architectures of MEMS ?
9. Explain the process of photolithography.
10. What are the various types of packaging in MEMS ?
11. Explain LIGA-like fabrication technology.
12. What is LPCVD ?
13. Explain about nano structure dynamics in MEMS .
14. Explain about quantization.

(4 × 3 = 12 weightage)

### Section C

*Answer any two questions.*

*Each question carries 5 weightage.*

15. Explain wave function theory.
16. Explain about surface micro machining.
17. Explain about piezo electric effect. Briefly describe the design of actuators using pizo electric crystals.
18. Explain the micro system fabrication processes.

(2 × 5 = 10 weightage)



**FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022**

(CBCSS)

Electronics

ELS 4E02E—FIBER OPTIC INSTRUMENTATION

(2020 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

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**Part A**

*Answer any four questions.*

*Each question carries 2 weightage.*

1. Explain the propagation of light in optic fiber.
2. A step-index fiber has a core index of refraction of  $n_1 = 1.425$ . The cut-off angle for light entering the fiber from air is found to be  $8.50^\circ$ .
  - (a) What is the numerical aperture of the fiber ?
  - (b) What is the index of refraction of the cladding of this fiber ?
  - (c) If the fiber were submersed in water, what would be the new numerical aperture and cut-off angle ?
3. Define BER. What are the factors that affect BER ? Explain.
4. Explain the working of optical switches.
5. Explain the modulation bandwidth of LED.

**Turn over**

6. Explain the principle of white light LED. Draw its output characteristics.
7. Explain the working of CCD detector.

(4 × 2 = 8 weightage)

### Part B

*Answer any four questions.*

*Each question carries 3 weightage.*

8. Explain the TE and TM modes in step index fiber.
9. What is dispersion ? Explain different types of dispersion.
10. Explain the working of Raman amplifier with a block diagram.
11. Explain the coherent optical QPSK transmitter with block diagram.
12. Explain the concept of radio over fiber system with a block diagram.
13. Explain the construction and working of a solar cell with a neat diagram.
14. Explain the principle of WDM with neat diagrams.

(4 × 3 = 12 weightage)

### Part C

*Answer any two questions.*

*Each question carries 5 weightage.*

15. Explain the ray model in optic fibers. Also explain meridional and skew rays and the paths in optic fiber.
16. Explain the measurement of longitudinal fiber properties using OTDR technique.
17. Explain the working of : (i) Quantum cascade laser ; and (ii) Micro-cavity laser.
18. Explain the different optical receiver configurations with necessary diagram.

(2 × 5 = 10 weightage)

**FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)  
EXAMINATION, APRIL 2022**

(CBCSS)

Electronics

ELS 4E 02D—VERILOG PROGRAMMING

(2019 Admissions onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

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**Part A**

*Answer any four questions.*

*2 weightages each.*

1. Explain port declarations in verilog.
2. Draw the DC characteristics of cmos inverter.
3. Define keyword and identifiers in verilog.
4. Why nmos transistor is selected as pull down transistor ?
5. Explain Case statement in verilog.
6. Explain the use of always statement in verilog.
7. Explain wire and reg in verilog.

(4 × 2 = 8 weightage)

Turn over

**Part B**

*Answer any **four** questions.*

*3 weightages each.*

8. Explain lambda based design rule.
9. Explain lexical tokens in verilog.
10. Write the Verilog code to implement a T flip-flop.
11. Explain about dynamic hazards.
12. Explain blocking and non blocking statements in Verilog with examples.
13. Explain Structural modeling in verilog.
14. Write Verilog code to implement half subtractor.

(4 × 3 = 12 weightage)

**Part C**

*Answer any **two** questions.*

*5 weightages each.*

15. Explain MOS capacitance models in detail.
16. Write the Verilog code to implement 4 bit down counter.
17. Explain structural and behavioral modelling in Verilog with examples.
18. Write Verilog code to implement 4 bit serial in parallel out shift registers and its testbench.

(2 × 5 = 10 weightage)

**FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022**

(CBCSS)

Electronics

ELS4E02B—DIGITAL IMAGE PROCESSING

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

**General Instructions**

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**Part A**

*Answer any four questions.*

*Each carries 2 weightage.*

1. What are the important applications of image processing ?
2. Give some of the image acquisition techniques.
3. What do you mean by HSI model ?
4. What is the importance of Hadamard transform ?
5. What are the various methods of histogram processing ?
6. What is a contra-harmonic filter ? Mention its applications.
7. What is the importance of Weigner filter ?

(4 × 2 = 8 weightage)

**Turn over**

**Part B**

*Answer any four questions.*

*Each carries 3 weightage.*

8. Give a brief description of various mathematical and logical operations on a digital image.
9. Discuss the basic gray level transformations for a digital image.
10. Give a short note on KL Transform and its properties.
11. Explain the image restoration model and how degradation function is estimated?
12. Explain how a geometric mean filter can be used to eliminate the noise in a digital image.
13. Explain the basic region based segmentation techniques employed in image processing.
14. Briefly explain the various matching techniques employed in image recognition.

(4 × 3 = 12 weightage)

**Part C**

*Answer any two questions.*

*Each carries 5 weightage.*

15. Explain the human visual perception.
16. Explain the properties of wavelet transform. Explain how wavelet transform is used in image processing.
17. What are the various noises affecting an image and explain how these noises can be eliminated using filters.
18. Explain how multilayer perceptron can be used as a classifier.

(2 × 5 = 10 weightage)

**FOURTH SEMESTER M.Sc. DEGREE (REGULAR/SUPPLEMENTARY)  
EXAMINATION, APRIL 2022**

(CBCSS)

Electronics

ELS 4E 02A—CRYPTOGRAPHY AND NETWORK SECURITY

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

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**Part A**

*Answer any four questions.*

*2 weightage each.*

1. What is Steganography ?
2. Define Hash function.
3. What is PGP ?
4. Define Masquerade attack.
5. What is Feistel Cipher ?
6. Write a note on S/MIME content types.
7. What is Arbitrated Digital Signature ?

(4 × 2 = 8 weightage)

**Turn over**

**Part B**

*Answer any **four** questions.*

*3 weightage each.*

8. Write a note on Security mechanisms.
9. Define Elliptic Curve Cryptography.
10. Explain Rotor Machine.
11. Define Public key Distribution scenario using public key Authority.
12. Explain Symmetric cipher model.
13. Illustrate OSI Security Architecture.
14. Encrypt the message 'MY NAME IS ATUL' with the keyword 'PLAYFAIR EXAMPLE' using Playfair cipher.

(4 × 3 = 12 weightage)

**Part C**

*Answer any **two** questions.*

*5 weightage each.*

15. Illustrate DES algorithm.
16. Depict in detail about PGP random number generator.
17. Explain in detail about Encapsulating security Payload.
18. Give a brief description about types of firewalls.

(2 × 5 = 10 weightage)



**FOURTH SEMESTER M.Sc. DEGREE [REGULAR/SUPPLEMENTARY]  
EXAMINATION, APRIL 2022**

(CBCSS)

Electronics

ELS 4C 12—ROBOTICS

(2019 Admission onwards)

Time : Three Hours

Maximum : 30 Weightage

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**Part A**

*Answer any **four** questions.*

*Each question carries 2 weightage.*

1. What is inverse kinematics problem ?
2. Discuss robot trajectory planning.
3. Discuss the working principle of Range sensors.
4. Explain the concept of triangulation technique.
5. Define degree of freedom.
6. Explain the concept of optical flow.
7. What is meant by gripper ? Explain.

(4 × 2 = 8 weightage))

**Turn over**

**Part B**

*Answer any four questions.*

*Each question carries 3 weightage.*

8. Write homogenous transformation matrices for rotation in 3D.
9. Explain the working principle of visual sensors.
10. Discuss the anatomy of Robot and explain the important parts of a robot with a neat sketch.
11. Define and explain a geometric Jacobian.
12. Explain the various capabilities and limitations of the robot languages.
13. What are the important steps in Robotic vision ?
14. What are the requirements and challenges of end effectors ?

(4 × 3 = 12 weightage)

**Part C**

*Answer any two questions.*

*Each question carries 5 weightage.*

15. Explain the role of image segmentation in robotic vision.
16. What are the uses of sensors in robot ? Give examples and explain any one.
17.
  - a) Explain the industrial applications of Robots.
  - b) Explain (i) Mobile robots ; and (ii) Micro robots.
18. What is the role played by control systems in the functioning of Robots ?

(2 × 5 = 10 weightage)