

MATHEMATICAL METHODS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) (i) Prove that $f(z) = z^n$ is analytic. (8)(ii) Find the residue of $f(z) = \frac{1}{(z^2 + 1)^2}$ about each singularity. (12)
Or(b) Prove that $\int_0^\pi \frac{1 + 2 \cos \theta}{5 + 3 \cos \theta} d\theta = 0$. (20)2. (a) Find the Fourier series for $f(x) = x^2$ in $-1 < x < 1$. (20)

Or

(b) (i) Find the Fourier transform of

$$f(x) = \begin{cases} 1 & \text{in } |x| < a \\ 0 & \text{in } |x| > a \end{cases} \quad (10)$$

(ii) Find the sine transform of the function

$$f(x) = \begin{cases} \sin x, & 0 \leq x < a \\ 0 & x > a \end{cases} \quad (10)$$

3. (a) (i) Prove that $L(e^{-at}) = \frac{1}{s+a}$ provided $s+a > 0$. (8)

(ii) Find $L[t^2 e^t \sin t]$. (12)

Or

(b) (i) Find $L^{-1}\left[\frac{1}{(s+1)^2}\right]$. (8)

(ii) Find $L^{-1}\left[\log \frac{s(s+1)}{s^2+1}\right]$. (12)

4. (a) Solve by iteration method $2x - \log_{10} x = 7$. (20)

Or

(b) Solve the following equation using Jacobi's iteration method. (20)

$$20x + y - 2z = 17$$

$$3x + 20y - z = -18$$

$$2x - 3y + 20z = 25.$$

5. (a) (i) Find $\int_0^6 \frac{dx}{1+x^2}$ using trapezoidal rule and Simpson's $\frac{1}{3}$ rule. (10)

(ii) Evaluate $\int_1^2 \frac{dx}{x}$ using Gauss 2 point formula. (10)

Or

(b) Using Runge-Kutta method, find an approximate value of y , when $x = 0.2$, given that $\frac{dy}{dx} = x^2 + y^2$ with $y = 0$ when $x = 0$. (20)

MEASUREMENT SYSTEM AND TRANSDUCERS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) Write a detailed note on units and standards. (20)

Or

(b) Explain the functional elements of a measuring system with an example. (20)

2. (a) With suitable sketches, explain the first order instrument with step, ramp, impulse and frequency responses. (20)

Or

(b) (i) What are dead time elements? (5)
(ii) Explain the logarithmic plotting of frequency response curves. (15)

3. (a) With suitable sketches, explain the working principle and characteristics of RTD. (20)

Or

(b) (i) Explain the working principle and characteristics of thermistor. (12)

(ii) Write a note on photo resistor. (8)

4. (a) Explain in detail, the modes of operation of variable inductive transducer. (20)

Or

(b) Give in detail, any two applications of capacitive transducer. (10 + 10)

5. (a) Explain the working of

(i) Hall effect transducer and

(ii) Eddy current sensor. (10 + 10)

Or

(b) Write notes on :

(i) IC temperature sensors and

(ii) IC pressure sensors. (10 + 10)

 LINEAR ICs AND APPLICATIONS

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) Explain the following terms in detail:
- (i) Input Bias current
 - (ii) Input offset current
 - (iii) Input offset voltage
 - (iv) Thermal drift. (5+5+5+5)
- Or
- (b) Explain the working of
- (i) differentiator and
 - (ii) Integrator using op. amp (10+10)
2. (a) Explain the working of
- (i) Non-inverting comparator (6)
 - (ii) zero-crossing detector (6)
 - (iii) sample and Hold circuit (8)
- Or
- (b) Discuss the performance of Band pass filter with suitable sketches. (20)

3. (a) Describe the working of
- (i) phase shift oscillator and
 - (ii) wein bridge oscillator circuits (10+10)

Or

- (b) With suitable diagram, Explain the working of voltage to frequency converter circuit with its output waveform. (20)

4. (a) Explain the operating principles and functional blocks of PLL with suitable sketches. (20)

Or

- (b) Describe the operation of
- (i) Square wave generator and
 - (ii) FSK generator using 555 timer. (20)

5. (a) (i) Explain the working of weighted resistor D/A converter (DAC) with necessary sketches. (10)

- (ii) Write a note on fixed voltage series regulator. (10)

Or

- (b) Describe the operation of
- (i) comparator type ADCs and
 - (ii) Counter type A/D converter. (10+10)

MICROPROCESSOR AND MICROCONTROLLER

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) With suitable examples, explain the instruction set of 8085 microprocessor. (20)
- Or
- (b) Draw the pin - out diagram of 8085 micro processor and explain the functions of each pin. (20)
2. (a) Draw the internal block diagram of 8255 A Programmable Peripheral Interface (PPI) and explain its function. (20)

Or

- (b) Explain the functions of 8259A programmable interrupt controller (PIC) with its internal block diagram. (20)
3. (a) Draw the internal architecture of 8086 microprocessor and explain the functions of each block. (20)

Or

- (b) Discuss the instruction set of 8086 microprocessor with suitable examples. (20)

4. (a) Explain with suitable circuit and program, the interfacing (i) a stepper motor to 8086 and (ii) a matrix key board to 8086. (10 + 10)

Or

- (b) Draw the block diagram of 8051 micro controller and explain its operation. (20)

5. (a) With suitable examples, explain the instruction set of 8051 micro controller. (20)

Or

- (b) (i) Write a note on interrupts in 8051. (10)

- (ii) Explain with suitable examples, the interrupt programming in 8051.

PRINCIPLES OF COMMUNICATION

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) (i) Explain the four types of signals. (10)
- (ii) Write a note on Fourier analysis of signals. (10)

Or

- (b) Describe a procedure for calculating the energy or power of a signal by using the Fourier transform of the signal. (20)

2. (a) Explain the operation of AM superheterodyne receiver with a neat block diagram. (20)

Or

- (b) Describe the working of Armstrong FM transmitter with a neat block diagram. (20)

3. (a) Write a detailed note on Differential Pulse Code Modulation (DPCM).

Or

- (b) Explain in detail, the correlative coding using duo binary encoding. (20)

4. (a) Explain Binary Frequency Shift Keying (BFSK) and its two types. (20)

Or

- (b) Write a detailed note on M-ARY PSK with its power spectra diagram. (20)

5. (a) What is a Radar? Give its basics. (20)

Or

- (b) Draw the block diagram of MTI radar and explain its fundamentals and working. (20)

CONTROL SYSTEM

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) What is a closed loop system? List its advantages. Explain the functions of basic components of an automatic control system with a neat block diagram. (4+2+14)

Or

- (b) Give a detailed note on signal flow graph. (20)
2. (a) Explain the various standard test signals with their mathematical representation. (20)

Or

- (b) Discuss the various time domain specifications with suitable example. (20)
3. (a) Explain the various graphical techniques (plots) available for frequency response. (20)

Or

- (b) Write a detailed note on Nichols chart. (20)

4. (a) Explain in detail, Root locus techniques. (20)

Or

- (b) Discuss the procedure for investigating the stability using Nyquist criterion. (20)

5. (a) Explain the state space representation using
(i) physical variables and (10+10)
(ii) phase variables.

Or

- (b) State and prove Cayley-Hamilton theorem. (20)

COMPUTER ARCHITECTURE

(For those who joined in June 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) Explain the functions of the main components in a typical computer system.

Or

(b) What is a stack? Explain in detail the stack organization with a neat block diagram.

2. (a) What is an Instruction Set Architecture (ISA)? Explain in detailed.

Or

(b) With a suitable sketch, explain the organization of micro programmed control unit.

3. (a) Explain the performance of cache memory.

Or

(b) Give a detailed account on communication methodologies.

4. (a) Give a detail account on Flynn's taxonomy.

Or

(b) Explain the operation of vector processor with suitable sketches.

5. (a) Describe the functions of a super SPARC processor with a neat block diagram.

Or

(b) Write a detailed note on fault tolerance computers.

DIGITAL SIGNAL PROCESSING

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

1. (a) What is a signal? Explain the five major types of discrete time signals. (20)

Or

- (b) Explain the properties of Fourier transforms in detail. (20)
2. (a) Discuss in detail the properties of DFT. (20)

Or

- (b) (i) Explain the linear convolution using DFT to analyse the response of a system. (8)
- (ii) Compute :
- (1) linear and
- (2) circular convolution for the following two sequences
 $x(n) = \{1, 3, 2, 4\}$ and
 $h(n) = \{1, 2, 1, 2\}$. (12)

3. (a) Explain in detail, the matrix representation of digital networks with suitable sketches. (20)

Or

- (b) Explain Tellegen's theorem for digital filters with its proof. (20)

4. (a) Discuss the design of IIR digital filters from analog filters. (20)

Or

- (b) Write notes on :
- (i) Digital butterworth filters and
- (ii) Inverse chebyshev filters. (10 + 10)

5. (a) Explain Goertzel algorithm in computing DFT. (20)

Or

- (b) Give a detailed note on general computational considerations in FFT algorithms. (20)

 FIBER OPTICS COMMUNICATION

(For those who joined in June 2006 and after)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) Explain the various elements of optical fiber communication system with suitable block diagram and list its advantages.

Or

- (b) (i) Explain the structure of single fiber.
 (ii) What is step index fiber? Discuss the power flow in step-index fibers.

2. (a) Discuss with suitable sketches, the HE₁₁ mode propagation characteristics.

Or

- (b) Discuss in detail, the power density distribution.

3. (a) Explain the working of :

- (i) PIN photo detector and
 (ii) Avalanche photo diode.

Or

- (b) Explain the recombination process involved in injection luminescence.

4. (a) Write note on :

- (i) Inter symbol interference and
 (ii) Eye diagram.

Or

- (b) Give a detailed account on Signal to Noise Ratio (SNR) calculation.

5. (a) Discuss in detail, LAN and computer networks.

Or

- (b) With suitable sketches, explain the principle and working of optical detector.

 COMPUTER NETWORKS

(For those who joined in June 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) (i) What is a computer network? Explain.
- (ii) Explain the various network topologies with their advantages and disadvantages.

Or

- (b) Discuss in detail ISO reference model for layered architecture.

2. (a) Explain the terms :

- (i) Protocol architecture and
- (ii) LAN topologies.

Or

- (b) (i) Explain the basic principle of token bus network.
- (ii) Give detailed account on token Passing and token Ring.

3. (a) Explain the functions of the five components of internet-working system.

Or

- (b) Explain in detail TCP/IP protocol.

4. (a) Explain with suitable sketches the various Broadband ISDN architectures.

Or

- (b) Give a detailed account on data compression.

5. (a) Explain the principle and working of Time Domain Reflectometry (TDR).

Or

- (b) Write a detailed note on network security.

DATA COMMUNICATION

(For those who joined in June 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) (i) State and explain sampling theorem.
(ii) Discuss the practical aspects of ordinary samples of finite duration.
- Or
- (b) Discuss in detail
 - (i) Differential Pulse-Code Modulation (DPCM) and
 - (ii) Delta Modulation. (DM).
2. (a) Explain in detail, the various binary data formats.
- Or
- (b) Describe the Duo binary signaling method in correlative coding with suitable diagrams.

3. (a) (i) Explain the cyclic codes with their properties.

(ii) Write a note on block interleaving.

Or

- (b) Explain the significances of three basis Automatic-Repeat Request (ARQ) system and discuss their performance.

4. (a) Discuss in detail, the Quadrature-shift keying method used in digital communication.

Or

- (b) Give a detailed account on M-ary modulation technique with necessary diagram.

5. (a) Explain with suitable wave forms, the Direct Sequence (DS) Spread Spectrum and its uses with CDMA.

Or

- (b) Describe in detail, the Frequency Hopping (FH) spread spectrum with suitable diagram.

MEDICAL ELECTRONICS

(For those who joined in June 2006 and after)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

(5 × 20 = 100)

1. (a) Draw the block diagram of bed side patient monitoring system and explain its working.

Or

(b) With the help of block diagram, explain the working of single channel telemetry system.

2. (a) Explain the principle and working of NMR blood flow meter with a neat block diagram.

Or

(b) Draw the block diagram of Doppler shift blood flow meter and explain its working.

3. (a) With a neat block diagram, explain the working of ECG machine and discuss its various waves.

Or

(b) Write notes on (i) Phonocardiography and (ii) Electromyography (EMG).

4. (a) Write notes on (i) Parallel flow dialyzers and (ii) High frequency heat therapy.

Or

(b) Explain the functions of various types of pacemakers.

5. (a) Explain in detail, the principles of nuclear magnetic resonance imaging systems with necessary sketches.

Or

(b) Explain the basic principle of X-Ray computed tomography with a suitable sketch.