

**B.Tech. First Year (Second Semester) Electrical Engineering / Civil Engineering /  
Mechanical Engineering / Electronics & Telecommunication Engineering**

**Numerical Methods and Calculus**  
**(EE24101 / CE24101 / ME24101 / ET24101)**

Total Pages : 4



\* 0 2 3 8 \*

## **Time : Three Hours**

Max. Marks : 60

### **Instructions to Candidates :**

1. Assume suitable data whenever necessary.
  2. Illustrate your answer with neat and clear sketch.
  3. Use of scientific calculator is allowed.

1. A) Solve the following multiple choice questions.

- i) What is the expected value (mean) for the Poisson Distribution  $n=16$ ,  $p=0.85$



ii) If the mean and variance of Binomial distribution are 5 and 4 respectively then is



B) Solve **any two** questions of the following.

- i) Ten percent of screws are produced in certain factory turn out to be defective. Find the probability that in sample of 10 screws chosen at random, exactly 2 will be defective.

- ii) If variance of a poison distribution is 2, find the probabilities for  $r=1, 2, 3, 4$  from the recurrence relation of the Poisson distribution.

- iii) In sample of 1000 cases, the mean of certain test is 14 and standard deviation is 2.5

- Assuming the normal distribution find how many students  
 a) between 12 and 15 ii) above 18  
 (SNV:  $z = 0$  to  $z = 0.8$ ,  $A = 0.2881$ ,  $z = 0$  to  $z = 0.4$   $A = 0.1554$ ,  $z = 0$  to  $z = 1.6$ ,  
 $A = 0.4452$ )

2 A) Solve the following multiple choice questions.

- The equation for fitting of a parabola  $y = a + bx + cx^2$  is -----

- $$\sum y = na + b\sum x + c\sum x^2 \quad \text{b) } \Sigma ay = na + b\sum x + c\sum x^2$$

- a)  $\Sigma y = na + b\Sigma x + c\Sigma x^2$       d)  $\Sigma ny = na + b\Sigma x + c\Sigma x^2$

- ii) The method of ----- is the most appropriate method to fit a unique curve through given data.
- a) Squares of square      b) Sum of square  
 c) Least square      d) None of above

B) Solve any two questions of the following.

- i) Fit a second degree parabola for the following data.

|   |   |   |   |   |    |    |    |    |   |
|---|---|---|---|---|----|----|----|----|---|
| x | 1 | 2 | 3 | 4 | 5  | 6  | 7  | 8  | 9 |
| y | 2 | 6 | 7 | 8 | 10 | 11 | 11 | 10 | 9 |

- ii) Find coefficient of correlation for the data.

|   |    |    |    |    |    |    |
|---|----|----|----|----|----|----|
| x | 10 | 14 | 18 | 22 | 26 | 30 |
| y | 18 | 12 | 24 | 6  | 30 | 36 |

- iii) Find the line of regression x on y for following data.

|   |     |     |     |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|-----|-----|-----|
| x | 62  | 64  | 65  | 69  | 70  | 71  | 72  | 74  |
| y | 126 | 125 | 139 | 145 | 165 | 152 | 180 | 208 |

3. A) Solve the following multiple choice questions.

- i) Divergence and Curl of a vector field are -----
- a) Scalar & Scalar      b) Scalar & Vector  
 c) Vector & Vector      d) Vector & Scalar
- ii) If  $\bar{F} = 3xi + 5yj + 6zk$ , then  $\nabla \cdot \bar{F}$  is
- a) 0      b) 3  
 c) 14      d) 2

B) Solve any two questions of the following.

- i) Find  $\text{div } \bar{F}$  and  $\text{Curl } \bar{F}$  if  $\bar{F} = \text{grad}(x^3 + y^3 + z^3 - 3xyz)$

- ii) Find the directional derivative of  $f(x, y, z) = x^2 - y^2 + 2z^2$  at the point P(1, 2, 3) in the direction of the line PQ where Q is the point (5, 0, 4)

- iii) Construct the angle between the surfaces  $x^2y + z = 3$  and  $x \log z - y^2 = -4$  at point of intersection (-1, 2, 1)

4. A) Solve the following multiple choice questions.

- i) Which of the following is also known as the Newton Raphson method?
- a) Chord method      b) Tangent method  
 c) Diameter method      d) Secant method
- ii)  $\sin x - 1 = 0$  is an -----
- a) Algebraic equation      b) Transcendental equation  
 c) Linear equation      d) Non linear equation

Solve any two questions of the following.

Find the cube root of 16 correct up to two decimal places using Newton Raphson Method. 4

Find the root the equation  $f(x) = xe^x - 3$  correct up to two decimal places using False Position Method. 4

iii) Solve the following method using Gauss Seidel's method  
 $10x + 2y + z = 9, 2x + 20y - 2z = -44, -2x + 3y + 10z = 22$  upto fifth approximation. 4

Solve the following multiple choice questions.

i) The fourth order R-K formula is ----- 1  
 a)  $y_1 = y_0 + (k_1 + 2k_2 + 2k_3 + k_4)$  b)  $y_1 = y_0 + (k_1 + 2k_3 + k_4)$   
 c)  $y_1 = y_0 + (k_1 + 2k_2 + 2k_3)$  d) None

ii) Picard -Method is use to solved  
 a) Algebraic equation b) Linear equation  
 c) Partial differential equation d) Ordinary differential equation 1

B) Solve any two questions of the following.

i) Solve  $y' = x + y, y(0) = 1$  by Taylor's series method hence find the value  $y$  at  $x = 0.1$  and  $x = 0.2$ . 4

ii) Using the Picard's method solve the following differential equations  
 $\frac{dy}{dx} = x + y^2, y = 0, \text{ when } x = 0 \text{ upto } y^3$

iii) Compute  $y(0.2)$  given  $\frac{dy}{dx} = x + y, y(0) = 1$  by using fourth order Range-Kutta method.

6. A) Solve the following multiple choice questions.

i) The distinguishing feature of a linear programming model is -----  
 a) Relationship among all variables is linear  
 b) It has a single objective function & constraints  
 c) Value of decision variables is non-negative  
 d) All of the mentioned

ii) If two constraints do not intersect in the positive quadrant of the graph then  
 a) The solution is unbounded  
 b) The problem is infeasible  
 c) One of the constraints is redundant  
 d) None of the mentioned

**First Year (First Semester) Electrical Engineering / Civil Engineering / Mechanical  
Engineering / Electronics & Telecommunication Engineering**

**Matrices and Differential Equations**  
**(EE24101 / CE24101 / ME24101 / ET24101)**

Total Pages : 4

Time : Three Hours



\* 0 0 0 4 \*

Max. Marks : 60

**Instructions to Candidates :**

1. All questions are compulsory.
2. Assume suitable data wherever necessary and clearly state the assumptions made.
3. Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
4. Use of pen Blue/Black ink/refill only for writing in Answer book.
5. Diagrams/sketches should be given wherever necessary.
6. Figures to the right indicate full marks.

**1. A) Solve the following multiple-choice question/s .**

- i) If A satisfied its eigen equation then ----- theorem is satisfied. 1
- a) Lagranges Theorem      b) De Moivre's Theorem
- c) Bernoulli's Theorem      d) Caley Hamilton Theorem
- ii) Which of the following is correct? 1
- a)  $\rho(A) = \rho(A : B)$  Then system is consistent
- b)  $\rho(A) = \rho(A : B)$  Then system is inconsistent
- c)  $\rho(A) = \rho(A : B)$  Then system is no solution
- d) None of the these

**B) Solve any one question of the following.**

- i) Find the eigen values and eigen vector of the matrix 8

$$A = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -2 & -1 \\ 0 & 0 & -3 \end{bmatrix}$$

- ii) For which values of  $\lambda$  the following set of equations are consistent and solve them 8
- $$x + 2y + z = 3, x + y + z = \lambda, 3x + y + 3z = \lambda^2$$

**2. A) Solve the following multiple choice question/s.**

- i) In  $(-L L)$  if the  $f(x)$  is Square function then 1
- a)  $b_n = 0$       b)  $a_n = 0$
- c)  $a_0 = 0$       d) None of these

ii) We get half range cosine Fourier series, when the function is -----

- a) Odd function
- b) Even function
- c) Can't be determined
- d) Can be anything

B) Solve any two questions of the following.

i) Obtain the Fourier series  $f(x) = x^2 - 2$  in  $-2 \leq x \leq 2$

ii) Analyze Harmonically the data given below and express  $y$  in Fourier series up to first Harmonic

|   |     |         |          |       |          |          |        |
|---|-----|---------|----------|-------|----------|----------|--------|
| X | 0   | $\pi/3$ | $2\pi/3$ | $\pi$ | $4\pi/3$ | $5\pi/3$ | $2\pi$ |
| Y | 1.0 | 1.4     | 1.9      | 1.7   | 1.5      | 1.2      | 1.0    |

iii) Find Fourier half range cosine series for  $f(x) = x^2$   $0 \leq x \leq \pi$

3. A) Solve the following multiple choice question/s.

i) Ordinary Differential equation has

- a) One independent variable
- b) Two or more independent variables
- c) More than one dependent variable
- d) Equal number of dependent and independent variables

ii) If  $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x}$  then the Differential equation is

- a) Exact D.E
- b) Non Exact D.E
- c) Linear D.E
- d) None Linear D.E

B) Solve any two questions of the following.

i) Solve  $\frac{dy}{dx} = (4x + y + 1)^2$ .

ii) Solve  $\cos x \frac{dy}{dx} + y + \sin x = 1$ .

iii) Solve  $(x - 4xy - 2y^2)dx + (y^2 - 4xy - 2x^2)dy = 0$

4. A) Solve the following multiple choice questions.

i) The equation  $Pp + Qq = R$  is known as

- a) Charpit's equation
- b) Lagrange's equation
- c) Clairaut equation
- d) Bernoulli's equation

- ii) The general solution of nonlinear PDE  $z = px + qy + pq$  is
- $z = ax^2 + by + ab$
  - $z = ay^2 + bx + ab$
  - $z = ay^2 + bx^2 + ab$
  - $z = ax + by + ab$

1

Solve any two questions of the following.

i) Solve  $\sqrt{p} + \sqrt{q} = 1$

4

ii) Solve  $p^2 + q^2 = x + y$

4

iii) Solve  $p \tan x + q \tan y = \tan z$

4

A) Solve the following multiple choice questions.

i) The value  $e^{i\theta}$  is

1

- $\cos\theta + i\sin\theta$
- $\cos\theta - i\sin\theta$
- $\cos\theta \mp i\sin\theta$
- $\cos\theta \pm i\sin\theta$

ii)  $(\cos\theta + i\sin\theta)^n = \cos n\theta + i\sin n\theta$  is the

1

- Lagrange's Theorem
- De Moivre's Theorem
- Bernoulli's Theorem
- Charpit's Theorem

B) Solve any two questions of the following.

4

i) Solve the equation  $x^{10} + 11x^5 + 10 = 0$ .

4

ii) If  $\log(x+iy) = p+iq$  then prove that  $y = x \cdot \tan \left( \frac{q}{p} \right)$

4

iii) Prove that  $\tanh^{-1} x = \sinh^{-1} \frac{x}{\sqrt{1-x^2}}$

4

6. A) Solve the following multiple choice questions.

1

- i) The data is equally spaced and interpolation is near the beginning of the data then -----  
 interpolation formula is used  
 a) Newton's backward difference      b) Newton's divided difference  
 c) Lagrange's      d) Newton's forward difference

1

- ii) Interpolation means estimating a value which lies  
 a) Outside the range of the dependent variables  
 b) Outside the given range of arguments  
 c) Within the given range of arguments  
 d) None of these

1

B) Solve **any one** questions of the following.

i)

|   |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|
| x | 3.1 | 3.2 | 3.3 | 3.4 | 3.5 |
| y | 0   | 0.6 | 1.0 | 1.2 | 1.3 |

8

Using Newton forward difference interpolation formula estimate  $f(3.17)$ .

ii) Find the divided difference polynomial and estimate  $f(1)$  From following table

8

|        |    |    |    |     |
|--------|----|----|----|-----|
| x      | -1 | 0  | 2  | 5   |
| $f(x)$ | 7  | 10 | 22 | 235 |

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# **Applied Chemistry**

(AI202 / CS202 / EE102 / CE102 / ME102 / ET102)

Total Pages : 3

### Time : Three Hours



Max. Marks : 60

### Instructions to Candidates :

- Instructions to Candidates :**

  1. All question carry equal marks.
  2. Assume suitable data wherever necessary.
  3. Diagrams and chemicals equations should be given wherever necessary.
  4. Use of pen Blue/Black ink/refill only for writing in Answer book.

- a) Solve the following multiple choice questions.

  - Among following which are units of hardness of water?
    - ppm
    - mg/lit
    - $^{\circ}\text{Cl}$
    - All of above
  - In ion exchange process, the cation exchange resin is regenerated by passing ----.
    - Acids
    - Dilute acids
    - Alkalies
    - Dilute Alkalies

b) Solve **any two** questions of the following:

  - Differentiate between scale and sludge. How these can be removed from boiler?
  - A sample of water contains following impurities, calculate it's temporary and permanent hardness.  
 $\text{Mg}(\text{HCO}_3)_2 = 73 \text{ mg / lit}$ ,  $\text{Ca}(\text{HCO}_3)_2 = 162 \text{ mg / lit}$ ,  
 $\text{CaSO}_4 = 136 \text{ mg / lit}$ ,  $\text{MgCl}_2 = 95 \text{ mg / lit}$ ,  $\text{KCl} = 35 \text{ mg / lit}$
  - Named the methods for water softening? Describe Zeolite process for water softening.

2. a) Solve the following multiple choice questions.

  - Corrosion can be prevented by-
    - Alloying
    - Tinning
    - Galvanizing
    - All of the above
  - Which of the following is the overall reaction of wet corrosion of iron?
    - $2\text{Fe}_{(\text{s})} \rightarrow 2\text{Fe}^{2+} + 4\text{e}^-$
    - $\text{O}_{2(\text{g})} + 4\text{H}_{(\text{aq})}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}_{(\ell)}$
    - $2\text{Fe}_{(\text{s})} + \text{O}_{2(\text{g})} + 4\text{H}_{(\text{aq})}^+ \rightarrow 2\text{Fe}_{(\text{aq})}^{2+} + 2\text{H}_2\text{O}_{(\ell)}$
    - $\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$

- b) Solve **any two** questions of the following:
- Describe following:
    - Pitting Corrosion
    - Waterline Corrosion
  - Explain working and application of Ni-Cd battery.
  - Write short note on:
    - Cathodic protection
    - Material selection against corrosion
3. a) Solve the following multiple-choice questions.
- Which of the following compound is considered for calculating the octane number?
    - n-heptane
    - n-hexane
    - ISO-octane
    - ISO-butane
  - Which fuel causes least pollution?
    - Diesel
    - Coal
    - Coke
    - Hydrogen gas
- b) Solve **any two** questions of the following:
- Define Calorific Value. Write the relationship between NCV and GCV.
  - What is Proximate analysis? Describe determination & significance of Moisture, Ash & fixed carbon.
  - A boiler is fired with the coal having the following composition  
 $C = 74\%$ ,  $H_2 = 6.8\%$ ,  $O_2 = 13.2\%$ ,  $N_2 = 2.1\%$  &  $S = 1\%$   
 Calculate minimum quantity of air required for the combustion of 1 kg of coal.
4. a) Solve the following multiple-choice questions.
- Select the incorrect statement from the following option.
    - Biodegradable Polymers are not suitable candidates in the recycling of commingled plastics.
    - Biodegradable polymer are very expensive.
    - Biodegradable polymer are an attractive option for addressing the solid waste.
    - Biodegradable polymer are easily available.
  - Thermosetting plastics are formed by---
    - Addition polymerization
    - Co-polymerization
    - Condensation polymerization
    - Isomerization

|            |   |                        |
|------------|---|------------------------|
| S25/B/1010 | Solve any two questions of the following:   | S25/B/1010             |
| i)         | Give preparation, properties and application of Bakelite.                               | 4                      |
| ii)        | Explain mechanism of free radical addition polymerization.                              | 4                      |
| iii)       | Give drawback of natural rubber. Explain vulcanization of rubber.                       | 4                      |
| a)         | Solve the following multiple-choice questions.  | 4                      |
| i)         | Which stone provides the calcareous component required for the manufacturing of cement? | 1                      |
| a)         | Lime  | b) Limestone           |
| c)         | Marble  | d) Granite             |
| ii)        | What is hydration of cement?  | 1                      |
| a)         | Chemical reaction of cement with acid   |                        |
| b)         | Chemical reaction of cement with water  |                        |
| c)         | Chemical reaction of cement with base   |                        |
| d)         | Chemical reaction of cement with salt and acid  |                        |
| b)         | Solve any two questions of the following:   | 4                      |
| i)         | Write short note on following:  |                        |
| a)         | Setting of cement   |                        |
| b)         | Soundness of cement   |                        |
| ii)        | Explain manufacturing method of cement by wet process with well labelled diagram.       | 4                      |
| iii)       | What is average composition of raw materials required for cement manufacturing.         | 4                      |
| 6. a)      | Solve the following multiple choice questions.  | 1                      |
| i)         | The resistance to the flow of liquid is-  |                        |
| a)         | Viscosity   | b) Viscosity index     |
| c)         | Thickness   | d) Surface tension     |
| ii)        | The thickness of the lubricant film in the hydrodynamic lubrication is about -----      | 1                      |
| a)         | 1000 <sup>o</sup> A   | b) 5000 <sup>o</sup> A |
| c)         | 500 <sup>o</sup> A  | d) 100 <sup>o</sup> A  |
| b)         | Solve any two questions of the followings:  | 4                      |
| i)         | Define:   |                        |
| a)         | Flash point   | b) Fire point          |
| c)         | Cloud point   | d) Pour point          |
| ii)        | What is Lubricant? Explain thin film Lubrication mechanism.                             | 4                      |
| iii)       | Give classification and function of Lubricant.  | 4                      |

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B.Tech. First Year (First Semester) Electronics & Telecommunication Engineering -  
**Basic Electrical & Electronics Engineering**  
**(ET103)**

Total Pages : 3



\* 0059 \*

**Max. Marks : 60**

## **Time : Three Hours**

### **Instructions to Candidates :**

1. Due credit will be given to neatness and adequate Dimensions.
  2. Assume suitable data wherever necessary.

1. A) Solve the following multiple choice questions.

1

- i) Ohm's law is not applicable to -----

  - a) dc circuits
  - b) High currents
  - c) Small resistor
  - d) Semi-conductor

ii) Kirchhoff law calculate which of the given electric parameters?

- a) Voltage
- b) Resistance
- c) Current
- d) Both a and c

1

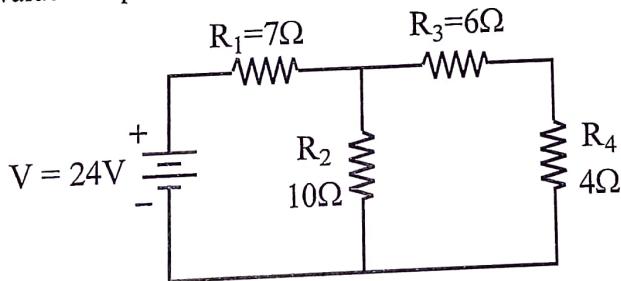
B) Solve **any two** questions of the following.

4

- i) State and explain the Kirchhoff voltage law with example.

ii) Determine the value of equivalent resistor of a circuit shown below

4



4

- iii) Define following terms:

|                         |               |
|-------------------------|---------------|
| a) Current              | b) Power      |
| c) Potential difference | d) Resistance |

2 A) Solve the following multiple choice questions.

1



ii) The inductor doesn't allow sudden changes in -----

- a) Voltage b) Current
- c) Resistance d) Inductance

P.T.O.

- Sketch and explain V-I characteristic  
 iii) Explain V-I characteristic  
 iv) Solve the following  
 v) For a P-N junction  
 collector

B) Solve **any two** questions of the following.

- i) Explain the following terms for sinusoidal signal
  - a) AC
  - b) DC
  - c) RMS value
  - d) Avg. value
- ii) Write the following terms for resistor, capacitor and inductor.
  - a) Symbol
  - b) Unit
  - c) Series values
  - d) Parallel values
- iii) Explain resonance in series R-L-C circuit and derive the expression for resonant frequency.

3. A) Solve the following multiple choice questions.

- i) If the voltage of the potential barrier is  $V_0$ . A voltage V is applied to the input, at what moment will the barrier disappear?
  - a)  $V < V_0$
  - b)  $V = V_0$
  - c)  $V > V_0$
  - d)  $V \ll V_0$
- ii) The inductor is placed in L section filter because -----
  - a) It offers zero resistance to DC component
  - b) It offers infinite resistance to DC component
  - c) It bypass the DC component
  - d) It bypass the AC component.

B) Solve **any two** questions of the following.

- i) Sketch & explain the V-I characteristic's of P-N junction diode.
- ii) Explain static and dynamic resistance of a diode.
- iii) Draw & explain center tap full wave rectifier.

4. A) Solve the following multiple choice questions.

- i) Zener diode are also known as
  - a) Voltage regulator
  - b) Forward bias diode
  - c) Breakdown diode
  - d) None of above
- ii) The tunneling involves -----
  - a) Acceleration of electrons in p-side
  - b) Movement of electrons from n-side conduction band to p-side valance band
  - c) Charge distribution in both bands
  - d) Positive slope characteristics of diode.

B) Solve **any two** questions of the following.

- i) Draw and explain the operation of Schottky diode

- ii) Sketch and explain V-I characteristics of Tunnel diode. 4
- iii) Explain V-I characteristics of Zener diode. 4
- A) Solve the following multiple choice questions. 1
- i) For a PNP transistor in the active region the value of potential difference between the collector and emitter is  
 a) Less than 0.3V      b) Less than 3V  
 c) Greater than 0.3V      d) Greater than 3V
- ii) To use FET as voltage-controlled resistor, in which region it should operate?  
 a) Ohmic region      b) Cutoff region  
 c) Saturation region      d) Both b and c
- B) Solve **any two** questions of the following. 4
- i) Define JFET parameters  
 i) DC drain resistance ( $R_D$ )      ii) AC drain resistance ( $r_D$ )  
 iii) Trans conductance ( $g_m$ )      iv) Amplification factor ( $\mu$ )
- ii) Sketch and explain drain characteristics of JFET. 4
- iii) Compare between D-MOSFET and E-MOSFET.
6. A) Solve the following multiple choice questions. 1
- i) What is the working principle of a Transformer  
 a) Principle of self-induction      b) Principle of mutual-induction  
 c) Principle of Ampere-law      d) Principle of ohm's law
- ii) What will happen, with the increase in speed of a DC motor.  
 a) Back emf increase but line current falls  
 b) Back emf fall and line current increase  
 c) Both increases  
 d) Both a and b
- B) Solve **any two** questions of the following. 4
- i) Derive the EMF equation of Transformer.
- ii) Compare between Iron loss & copper loss
- iii) Differentiate between DC series motor and DC shunt motor.
- \*\*\*\*\*

**M. Tech. (Electronics & Telecommunication) First Year (First Semester)**  
**Advanced Digital Signal Processing**  
**(ETC101)**

**Total Pages : 2****Time : Three Hours****Max. Marks : 60****Instructions to Candidates :**

1. If the question involves mathematical formulations, write the equations clearly and show the steps involved in deriving the solution.
2. Neatness and legibility are essential.

**1.** Solve the following question/s.

- a) State and explain the time-bandwidth relationship in the context of signal processing. 5
- b) Explain the differences between the Decimation-In-Time (DIT) and Decimation-In-Frequency (DIF) FFT algorithms. 5

**OR****2.** Solve the following question/s.

- a) What is the significance of the Z-transform in the analysis of discrete-time systems? 5
- b) Explain the concept of Linear Filtering of long data sequences using the FFT algorithm. 5

**3.** Solve the following question/s.

- a) Explain the design of a low-pass FIR filter using the Fourier Series method. 5
- b) Explain the concept of differentiators in FIR filter design. 5

**OR****4.** Solve the following question/s.

- a) Describe the FIR filter design using Hamming, Hanning, Blackman, and Kaiser windows. 5
- b) Explain the Equi-ripple FIR filter design method and its applications. 5

**5.** Solve the following question/s.

- a) Explain the Impulse Invariance Method for IIR filter design. 5
- b) Explain the design of analog filters: Butterworth and Chebyshev filters. 5

**OR****6.** Solve the following question/s.

- a) What are frequency transformations in the analog and digital domains? 5
- b) What are the main sources of finite word length effects in digital filters, and how can they be mitigated? 5

7. Solve the following question/s.
- What are Poly-phase filters and how are they used in multi-rate systems?
  - Explain Uniform DFT Filter Banks and their role in multi-rate processing.
- OR**
8. Solve the following question/s.
- What are Quadrature Mirror Filters (QMF) and their applications in multirate signal processing?
  - Explain the Interpolation by a Factor of 2 in multi-rate systems, and its significance.
9. Solve the following question/s.
- Explain the key challenges and techniques involved in the preprocessing of ECG and EEG signals for effective diagnosis. Discuss the role of filters, feature extraction, and classification algorithms in these applications.
  - How is DSP applied in radar signal processing?
- OR**
10. Solve the following question/s.
- How does VoIP handle the compression and transmission of speech signals? Explain the role of codecs in VoIP and discuss the application of DTMF signals in telecommunication systems.
  - Discuss the key components of signal processing involved in audio and video players for playback and compression. How do psychoacoustic models aid in audio compression
11. Solve the following question/s.
- Provide an introduction to Hilbert Space Theory and discuss how it is related to wavelet theory. How does the concept of an orthonormal basis in Hilbert space apply to wavelets?
  - What is the Discrete Wavelet Transform (DWT) and how does it differ from the Continuous Wavelet Transform (CWT)?
- OR**
12. Solve the following question/s.
- Discuss the concept of sub-band coding and its relation to wavelet transforms. How does sub-band coding optimize signal representation in terms of compression and transmission?
  - What is the scaling function in the context of wavelet transforms, and how does it relate to the concept of multi-resolution analysis?

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