**R-15**

**Code: 5GC32**

II B.Tech. I Semester Supplementary Examinations October 2020
# Mathematical Methods-III
( Common to EEE & ECE )

Max. Marks: 70                                                                                      Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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### UNIT–I

1.  a)  Determine the rank of the matrix $\begin{bmatrix} 0 & 1 & 3 & 1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & 0 & 2 \\ 1 & 1 & 2 & 0 \end{bmatrix}$

    b)  Find whether the following system of equations are consistent. If so, solve them
        x + 2y + 2z = 2 ; 3x - 2y - z = 5 ; 2x - 5y + 3z = - 4 ; x + 4y +6z = 0

**OR**

2.  a)  Solve the equations 3x + y + 2z = 3, 2x -3y - z = - 3 , x + 2y + z = 4 using Guass elimination method

    b)  Prove that the Eigen values of a triangular matrix are just the diagonal elements of the matrix.

### UNIT–II

3.  a)  Evaluate $\sqrt[3]{24}$ by Newton Raphson method

    b)  Employ Taylor's method to obtain appropriate value of *y* at *x* = 0.2 for the differential equation $\frac{dx}{dy} = 2y + 3e^x$, $y(0) = 0$. Compare the numerical solution obtained with the exact solution.

**OR**

4.  a)  Find a real root of $x^3 - x^2 - 1 = 0$ by Bisection method

    b)  Using Euler's method find an approximate value of y corresponding to $x = 1$, given $\frac{dx}{dy} = x + y$ and $y = 1$ when $x = 0$

### UNIT–III

5.  a)  Find the missing term in the table

| x | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| f(x) | 1 | 3 | 9 | - | 81 |

    b)  Find first and second derivatives of y at x=1.5 if

| x | 1.5 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|
| y | 3.375 | 7.000 | 13.625 | 24.000 | 38.875 | 59.000 |

**OR**

6.  Find $\frac{dy}{dx}$ and $\frac{d^2 y}{dx^2}$ at *x* =1.1 from the following table:

| x | 1.0 | 1.1 | 1.2 | 1.3 | 1.4 | 1.5 | 1.6 |
|---|---|---|---|---|---|---|---|
| y | 7.989 | 8.403 | 8.781 | 9.129 | 9.451 | 9.750 | 10.031 |

7. a) Fit a straight line to the following data

| x | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| y | 9 | 8 | 10 | 12 | 11 | 13 | 14 | 16 | 5 |

b) Form the partial differential equation by eliminating a and b from
$2z=(x-a)^{1/2}+(y-a)^{1/2}+b$.

**OR**

8. a) Fit a straight line by the method of least squares method to the following data

| x | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| y | 14 | 27 | 40 | 55 | 68 |

b) Form the partial differential equations (by eliminating the arbitrary constants and arbitrary functions) from

$(i)\ z = a\,x + b\,y + a^2 + b^2$ and $(ii)\ z = f(x + a\,y) + g(x - a\,y)$

UNIT–V

9. a) Obtain a half range cosine series for $f(x) = (x-1)^2$ in interval $0 < x < 1$. Deduce the sum of

series $\dfrac{1}{1^2} + \dfrac{1}{3^2} + \dfrac{1}{5^2} + - - - + \infty = \dfrac{f^2}{8}$

b) Find the Fourier sine transform of the function $f(x) = \dfrac{e^{ax}}{x}, a > 0$.

**OR**

10. a) Find the half range cosine series for $f(x) = x^2$ in the range $0 \le x \le f$

b) Find the sine and cosine transform of $f(x) = \begin{cases} \sin x, 0 < x < a \\ 0, x \ge a \end{cases}$

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# Signals and Systems
( Electronics and Communication Engineering )

Max. Marks: 70                                                                       Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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## UNIT–I

1. a) Classify the systems based on the properties and explain each with an example          7M

   b) Find whether the signal f(t) = 10 Sin (12 t) + 2 u(t) is periodic or not? If periodic what is its fundamental period          7M

**OR**

2. a) Discuss the concept of exponential Fourier series and derive the expressions for coefficients.          7M

   b) Obtain the trigonometric Fourier series for the signal x(t)=   A for 0<t<

   -A for    <t<2          7M

## UNIT–II

3. a) Derive Fourier Transform from Exponential Fourier series?          7M

   b) Find the Fourier Transform of the signals.
      (i)  $u(t)$
      (ii) $e^{-3t}\cos t\; u(t)$          7M

**OR**

4. a) State and Prove the Time Scaling and Time Differentiation properties of Fourier Transform          7M

   b) Using properties of Fourier Transform, Find the Fourier Transform of the signals
      *(i)* $e^{-3t}u(t-2)$
      *(ii)* $t\,e^{-3t}u(t)$          7M

## UNIT–III

5. a) What is an LTI system? Explain its properties. Derive an expression for the transfer function of an LTI system.          7M

   b) Obtain conditions for the distortion less transmission through a system.          7M

**OR**

6. a) A causal LTI system is described by y[n]-3y[n-1] +7y[n-2] = x[n] ,where x[n] is the input to the system h[n] is the impulse response of the system. Find System function H(z) and Impulse response h(n)          7M

   b) Derive the relation between bandwidth and rise time.          7M

## UNIT–IV

7. a) Define Nyquist Rate and then find the Nyquist Rate for the following signals:
      i) Rect (300t)      ii) 10 Cos 300 t.          7M

   b) Find the graphical convolution between the signals $[u(t)+u(t-\tau)]$ and $e^{-\tau}u(t)$.          7M

**OR**

8. a) State and prove properties of Auto-correlation and Cross-correlation.          7M

   b) Explain how a signal is reconstructed from its Samples with corresponding equations and waveforms.          7M

## UNIT–V

9. a) Give the relation between DTFT and Z-Transform.          4M

   b) State and Prove the following properties of Laplace Transform.
      i). Initial-value theorem
      ii). Final-Value theorem
      iii). Time Scaling Property
      iv). Time Scaling Property
      v). Time-differentiation Property          10M

**OR**

10. a) State the properties of ROC of Laplace Transform.          8M

    b) Find the Laplace transform of the following signals.
       i) Impulse function ii) unit step function iii) A sin(w₀t)u(t)          6M

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**R-15**

**Code: 5G332**

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## Digital Design

( Electronics and Communication Engineering )

Max. Marks: 70                                        Time: 3 Hours

Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT–I**

1. a) Explain different methods used to represent negative numbers in binary system    4M

   b) Perform the subtraction with the following unsigned binary numbers by taking the 2's complement of the subtrahend.
   - i. 11010-10010
   - ii. 11011-1101
   - iii. 100-110000
   - iv. 11-1011    10M

**OR**

2. a) Convert the given gray code number to equivalent binary 1001001011110010    4M

   b) Convert the following to decimal and then to octal
   - i. $(257)_{16}$
   - ii. $(10110001)_2$
   - iii. $(254)_{10}$
   - iv. $(865)_{10}$    10M

**UNIT–II**

3. a) Obtain the dual of the following boolean expressions.
   - i. A'B'C'+A'BC'+AB'C'+ABC'
   - ii. AB+(AC)'+AB'C
   - iii. ABEF+ABE'F'+A'B'EF    7M

   b) Use the tabulation procedure to generate the set of prime implicants and to obtain all the minimal expressions for the following function
   
   F(A,B,C,D)= m(0,1,4,5,6,7,9,11,15)+ d(10,14)    7M

**OR**

4. a) Minimize the following expression using k-map
   
   F(A,B,C,D)= m(1,4,7,10,13)+ d(5,14,15)    7M

   b) Find the complement and the dual of the function given below and then reduce it to a minimum number of literals in each case. F=[(ab)'a][(ab)'b]    7M

**UNIT–III**

5. a) Design a PLA to realize the following three logic functions and show the internal connections
   
   F1(a,b,c,d,e)= a'b'd'+b'cd'+a'bcd'e        F2(a,b,c,d,e)= a'be+b'cd'e
   
   F3(a,b,c,d,e)= a'b'd'+b'cd'e+a'bcd    10M

   b) Write a brief note on:
   - i. Architecture of PLD's
   - ii. PAL    4M

**OR**

6. a) Design a logic circuit to convert BCD to gray code    7M

   b) Design a full subtractor using two half subtractors    7M

**UNIT–IV**

7. Design a synchronous 3-bit Up-down counter using J-K Flip Flops — 14M

**OR**

8. a) With neat sketches explain the operation of Toggle and D flipflops — 7M

   b) Perform J-K to S-R flipflop conversion — 7M

**UNIT–V**

9. a) Discuss about the Salient Features and Blocks of ASM chart. — 7M

   b) Draw an ASM chart and state table for 2 bit up-down counter having mode control input.

   M = 1 up counting; M = 0 down counting

   The circuit should generate a output 1 whenever the count becomes minimum or maximum — 7M

**OR**

10. a) Discuss the capabilities and limitations of FSM. — 7M

    b) Draw the ASM chart of binary multiplier and design the control circuit using each of the following methods:-

    i) JK flip flop & gates

    ii) D flip flop & decoder. — 7M

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**Electrical Circuit Theory**
( Electronics and Communication Engineering )
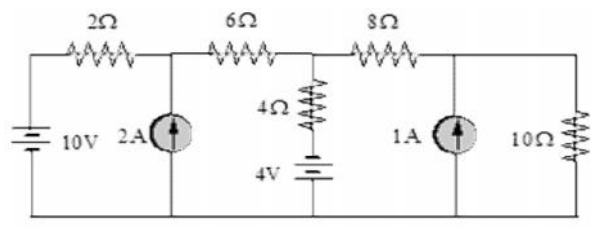
Max. Marks: 70                                                                Time: 3 Hours
Answer *all five* units by choosing one question from each unit ( 5 x 14 = 70 Marks )
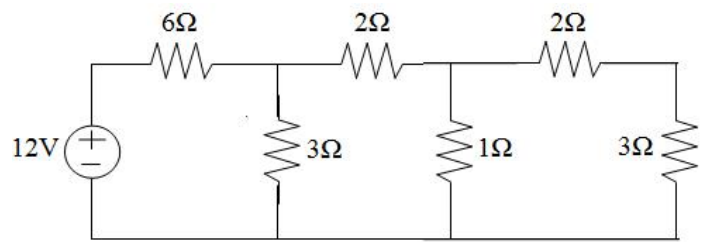*********

### UNIT–I

1.  Simplify the circuit into one voltage source in series with a resistor and find the current in 10 ohms resistor using source transformation technique.



14M

**OR**

2.  Determine the loop currents using Mesh Analysis and also the branch voltages



14M

### UNIT–II

3.  a) Explain the advantages of AC supply                                                        6M

    b) A series circuit consisting of a resistor of 10 ohms and an inductance of 100mH is connected across a 200V, 50Hz, single phase ac supply. Determine the current drawn, real power and reactive power        8M

**OR**

4.  a) Define Average & RMS Value, Form Factor & Peak Factor.                          7M

    b) Explain about the sinusoidal response of series RL circuit.                          7M

### UNIT–III

5.  A steel ring of 180cm mean diameter has a cross-sectional area of 250mm$^2$. Flux developed in the ring is 250µWb when a 4000 turns coil carries certain current. Calculate i) MMF required ii) Reluctance iii) current in the coil. Assume relative permeability of steel is 1100.      14M

**OR**

6.  a) Define self & mutual inductance. Derive the expression for coefficient of coupling.      7M

    b) A coil of 100 turns is wound uniformly over an insulator ring with a mean circumference of 2m and a uniform cross sectional area of 0.025cm$^2$. If a coil is carrying a current of 2A. Calculate MMF, Magnetic field intensity, Flux density, total flux.      7M

### UNIT–IV

7.  Obtain the relationship between line and phase voltages and currents in Delta connection with phasor diagram.      14M
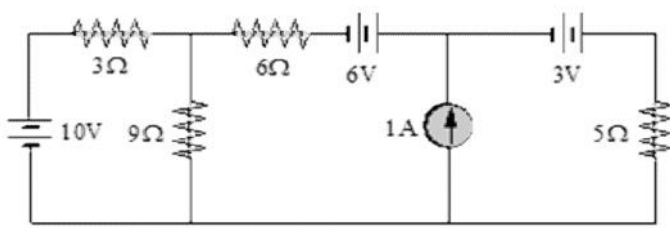
**OR**

8.  Obtain the relationship between line and phase voltages and currents in Star connection with phasor diagram.      14M

### UNIT–V

9.  a) State and explain Superposition theorem with an example                          7M

    b) State and explain Millman's theorem.                                                        7M

**OR**

10. In the circuit find the power consumed by 5 ohms resistor using Thevenin's theorem.



14M

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**Code: 5GC34**

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# Environmental Science

( Common to ECE & IT )

Max. Marks: 70                                                                    Time: 3 Hours

*Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )*

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## UNIT–I

1.  a)  List and explain the four conceptual spheres in the earth's environment.

    b)  Summarize the need for public awareness about environment.

**OR**

2.  Explain the scope and importance of environmental studies.

## UNIT–II

3.  a)  What are renewable and nonrenewable natural resources? Give examples.

    b)  Summarize the causes of deforestation.

**OR**

4.  Discuss the merits and demerits of traditional agriculture and modern agriculture.

## UNIT–III

5.  Identify and explain the major threats to the biodiversity.

**OR**

6.  Define ecosystem. Explain the characteristics, structure and function of forest ecosystem.

## UNIT–IV

7.  a)  Give an account of adverse effects of air pollution.

    b)  Discuss the adverse effects and control of water pollution.

**OR**

8.  a)  Describe the management of solid waste.

    b)  Discuss the various effects and control measures of thermal waste.

## UNIT–V

9.  a)  What are the greenhouse gases? Discuss the potential and contribution of these gases to global warming phenomenon.

    b)  Define pollution as per water (Prevention and Control of pollution) Act?  What are the salient features of this act?

**OR**

10. a)  What is meant by population explosion? Discuss the Indian scenario?

    b)  Describe the value based environmental education.

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