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[Total No. of Pages : 3]

Roll No. _____

3E1206

3E1206

B.Tech. III-Sem. (Main/Back) Examination, January - 2025

Automobile Engg.

3AE2-01 Advance Engineering Mathematics-I

AN, AG, AE, CE,CR,EC,EI,ME,MH,PT

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1 What is the value of $\Delta^n\left(e^x\right)$; if h = 1.

2. Write the trapezoidal rule.

3. Write the formula for Euler's modified method.

4. Find the first approximation to a real root of equation $x^3 - 3x^2 - 2 = 0$ by Regula falsi method between 3 to 4.

5. What are the existence conditions of Laplace transform?

6. Find $L^{-1}\left[\frac{1}{s^2}\right]$

7. Define Fourier sine and cosine transforms.

[Contd...

8. Find the Fourier transform of $f(t)=1, |t|<1$.

9. Find the Z - transform of the sequence $u_n = \{2, -4, 6, -8\}$.

10. Find $Z^{-1}\left[\frac{z}{z-3}\right]$.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Using Lagrange's interpolation formula, find the value of $y=f(x)$ at $x=9.5$ for the following:

x	7	8	9	10
$f(x)$	3	1	1	9

2. Compute the value of $\int_0^6 \frac{dx}{1+x^2}$ by Simpson's "⅓" rule.

3. Using Euler's method, solve the differential equation $\frac{dy}{dx}=x+y$; with initial condition $y(0)=1$ for $x=1$, using $h=0.2$

4. Find Laplace transform of Sin $\sqrt{t}$

5. Find $L^{-1}\left[\frac{4s+5}{(s+2)(s-1)^2}\right]$

6. Find the Fourier Sine and cosine transform of f(x), where $f(x)=\begin{cases}1, & 0<x<a\\ 0, & x>a\end{cases}$

7. Using convolution theorem, evaluate $z^{-1}\left[\frac{z^2}{(z-1)(z-3)}\right]$

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any Three questions. **(3×10=30)**

1. Use Stirling's formula to find y at $x = 12.2$ from the following data:

x:	10	11	12	13	14
y:	23967	28060	31788	35209	38368

2. Calculate y (0.2) using Runge - Kutta fourth order method to solve $\frac{dy}{dx} = x + y^2,\ y(0) = 1,\ h = 0.2$

3. Use Laplace transform to solve $(D^2+25)y=10\cos 5x$, given that $y(0)=2,\ y'(0)=4$.

4. Find the complex fourier transform of $e^{-|x|}$

5. Use Z transform to solve the difference equation. $U_{n+2} + 4U_{n+1} + 3U_n = 3^n$, given that $u_0 = 0, u_1 = 1$.

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3E1200

Roll No. _____ [Total No. of Pages : 2]

3E1200

B.Tech. III-Sem. (Main/Back) Examination, January - 2025

Artificial Intelligence & Data Science

Managerial Economics and Financial Accounting

Common to All Branches

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used! calculated must be stated clearly. Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1 Define the term economics.

2. What do you mean by profit and loss statement.

3. Differentiate between monopoly and monopolistic competition.

4. What do you mean by opportunity cost.

5. What does financial accounting mean.

6. Why do economic problems arise.

7. What do you mean by marginal product of an input. How is it calculated.

9. What does liabilities mean.

10. What does the circular flour model dipicts.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Explain the inductine and deductine methods of economic analysis.
2. Discuss the concept of kinked demand curve under oligopoly.
3. Write short notes on ratio analysis.
4. Explain the concept of demand and elasticity of demand.
5. Discuss the concept of least cost combination of inputs.
6. Discuss various concepts of National Income.
7. Explain the methods of demand forecasting.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any Three questions. **(3×10=30)**

1. Critically examine the methods of evaluating capital budgeting proposals.
2. Discuss the price and output determination under perfect competition.
3. Using suitable diagram, explain the law of variable proportions.
4. Explain with the help of curves, relationship between various cost concepts.
5. What do you mean by balance sheet. Discuss.

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3E1222

Roll No. _____ [Total No. of Pages : 4

3E1222

B.Tech. III-Sem. (Main/Back) Examination, January - 2025
Electronics Inst. & Control Engg.
3EI4-04 Digital System Design
EC,EI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of Seven questions from Part B and Three questions out of Five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1 Find the sum of $(1.98)_{10}+(4.86)_{16}$.

2. Determine the radix value (r) for following equation $(135)_r+(144)_r=(323)_r$.

3. State and prove the DeMorgan Theorem.

4. Simplify the following Boolean Function $(A+\bar{B}+AB)(A+\bar{B})(\bar{A}B)$.

5. State the difference between Latch and flip flop.

6. Write the excitation table of JK flip flop.

7. Which logic family given highest speed and why?

8. Why Totem pole output can't be connected together?

9. Write the minimum number of flip flop required to design Mod 28 Counter.

10. If the present output of 4-Bit ring shift register is 1011. Then find its output after 4 clock cycle.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. Consider a signed binary number are A = 01000110, B=11010011 where B is in 2's complement form. Find the value of following mathematical expression?

   a) A+B

   b) B-A

   c) A-B

   d) -A-B

2. Design the following logic gates using 2:1 mux:-

   a) Ex-OR

   b) NAND

   c) OR

3. Reduce the following expression using k-map $F(A,B,C,D) = \pi M(4,5,6,7,8,12)+d(1,2,3)$

4. Implement the following using only one 4:1 mux $F(x,y,z) = \Sigma(1,3,4,6,7)$

5. Explain the procedure for the convension of JK flip flop to D flip flop.

6. What are prime implicants, essential prime implicants & redundant prime implicants? Explain briefly.

7. Explain process statement with respect to behavioural modelling? Also write VHDL code of JK FF using behavioral modelling.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any Three questions **(3×10=30)**

1. Draw and explain the logic diagram of BCD adder using two 4-Bit adders and a correction detection circuit

2. a) Design a full subtractor using 3:8 Decoder.

   b) Find the Boolean function implemented by 4:1 mux as shown in Fig 1.

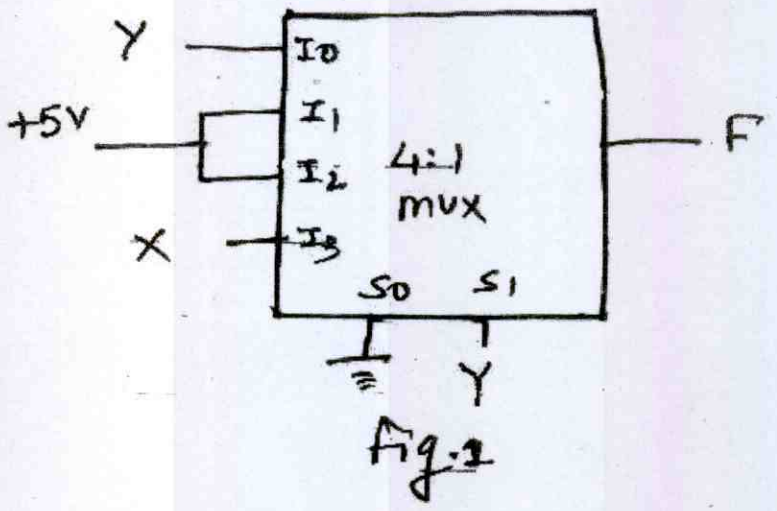

Fig.1

3. a) What is FPGA? Explain briefly.

   b) Design a 2 input NoR gate using CMOS logic family and explain its working also.

4. Design a binary counter with following binary sequence using D - flip flop 7,3,1,2,5,4,6,7,3,1,2---

5. a) What are different types of modelling styles used in VHDL? Explain briefly.

   b) Write the VHDL code for 4-bit ripple carry adder using structural modelling.

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3E1225

Roll No. _____ [Total No. of Pages : 3

3E1225

B.Tech. III-Sem. (Main/Back) Examination, January - 2025
Electronics Inst. and Control Engg.
3EI4-05 Signal & Systems
EC,EI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all Ten questions from Part A, five questions out of Seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. Define energy and power signals.

2. Plot the signal

   a) $x[n]=u[n]-u[n-4]$

   b) $x(t)=4\delta(t+2)$

3. Draw block diagram representation for LTI system described by the difference equation $y[n]=\frac{1}{3}y[n-1]+x[n-1]$

4. Write differentiation and Integration in time properties of discrete time Fourier transform.

5. Write Fourier series coefficients of even and odd signals.

6. State time shifting and multiplication properties of Laplace transform.

7. Write scalling and time reversal properties of Z - transform

8. What is Nyquist sampling rate for $x(t)=1+10\sin(200\pi t)+30\cos(40\pi t)$.

9. Write Parseval's relation for continuous time and discrete time aperiodic signals.

10. What is state space analysis write two advantages of state space representation.

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

1. What is unit step response of an LTI system? What is its relation with unit impulse response.

2. Determine whether the following signals are energy signals, power signals, or neither

   a) $x[n]=\cos\left(\frac{\pi}{4}n\right)$

   b) $x(t)=tu(t)$

3. Determine the z-transforms and sketch the ROC and Poles and zeros in z-plane for the signal: $x[n]=\left(\frac{1}{2}\right)^n u[n]+2^n u[-n-1]$.

4. Determine the CTFT and draw magnitude and phase spectrum for $x(t)=A\text{sinc}\left(\frac{t}{2\pi}\right)$

5. Determine the discrete time Fourier transform (DTFT) and draw magnitude and phase spectrum for $x(n)=a^{|n|}, |a|<1$.

6. Determine the Laplace transform, depict region of convergence and pole zero plot for signal $x(t) = te^{-4|t|}$.

7. State the initial and final value theorems of Laplace transform. Also write their applications.

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any Three questions. **(3×10=30)**

1. Write properties of convolution. Perform convolution between the signals $x(t) = u(t-2) - u(t-4)$ and $h(t) = e^{-3t}u(t)$.

2. Discuss the linearity, shift-invariance, and causality and stability properties of systems.

3. Find inverse z-transform of $X(z) = \dfrac{z^{-1} - \frac{1}{2}}{\left(1 - \frac{1}{2}z^{-1}\right)^2}, |z| > \dfrac{1}{2}$

4. A causal LTI system represented by the difference equation $y[n] + \frac{1}{2}y[n-1] = x[n]$,

   a) Find frequency response $H(e^{jw})$ of this system

   b) Determine output response of the system $y[n]$ to input $x[n] = \left(\frac{1}{2}\right)^n u[n]$

5. Write Nyquist sampling theorem. Derive the expression and draw the spectrum of sampled signal showing all three conditions of sampling. Explain the aliasing effect.

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3E1224

Roll No. _____ [Total No. of Pages : 4

3E1224

B.Tech. III-Sem. (Main/Back) Examination, January - 2025
Electronics Inst. & Control Engg.
3EI4-06 Network Theory
EC,EI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A
(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1 A Star has $R_A = 50\ \Omega$, $R_B = 2\Omega$ $R_c = -j10$. Find its R_{AC} in the equivalent delta. structure.

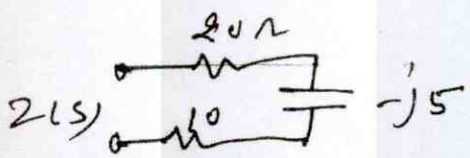
2. A Voltage source $20\angle 30^\circ$, $R_s = j5$ convert it to its equivalent current source.

3. Write the units of following two port parameter Z_{21}, A, Y_{11}, h_{21}

4. Write two necessary conditions for positive real immittance functions.

5. Transform a capacitor of 2 farad with 20 coloumb initial charge accross it.

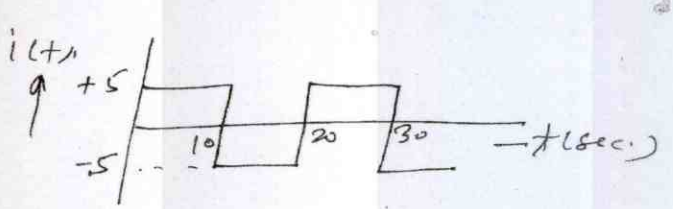
6. Draw the Pole-zero diagram of Z(S) in a Rc - Network given below.



7. A voltage V(s) is given by $V(S) = \frac{S+20}{S^2+20S+4}$ Find its initial and final value.

8. Define the Half wave symmetry for a periodic non sinusoidal wave.

9. Find the average and effective value of following current.



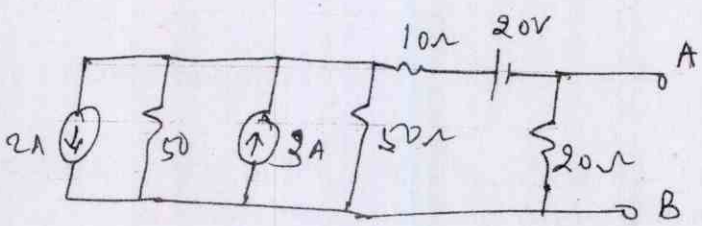
10. State maximum power transfer theorem.

PART - B

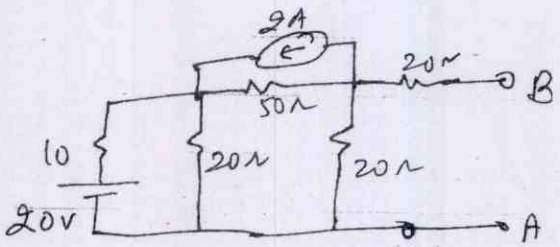
(Analytical/Problem solving questions)

Attempt any Five questions. **(5×4=20)**

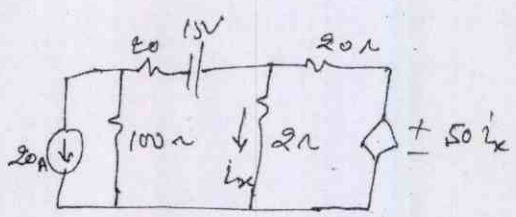
1. What is source transformation? Find the equivalent voltage source at terminal AB in following Network with source transformation technique.



2. Define Thevenin Theorem . Find the equivalent voltage source at AB using Thevenin Theorem in following network.



3. Find the current in 20 Ω resistor with superposition



4. Express ABCD parameter in terms of h-parameter. If the voltage current of a two port network is interrelated by following equation then find its h-parameter.

$v_1 = 0.5I_2 + 10v_2 + 4i_1$

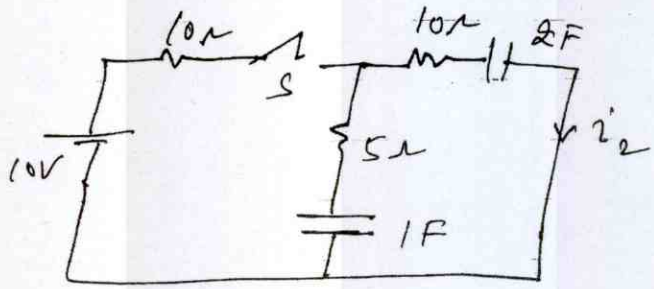
$v_2 = 20\ (i_1 + 4i_2)$

5. Write the necessary conditions of a positive real immittance function. Also find the pole zero of an impedance function.

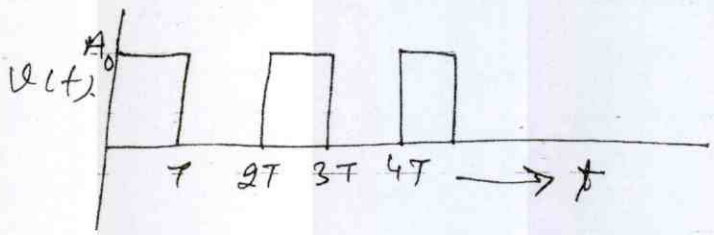
$$Z_{12}(s) = \frac{s^2 + s + 1}{s^3 + 10s^2 + s + 9}$$

Check its validity also.

6. The switch is close at t=0 find the transient response of current i_2 (t).



7. Find the trignometric series of following wave form.

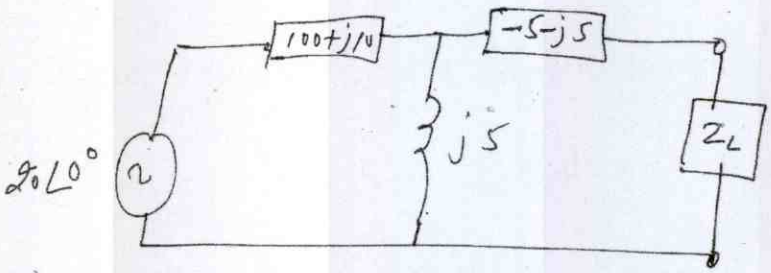


PART - C

(Descriptive/Analytical/Problem Solving/Design question)

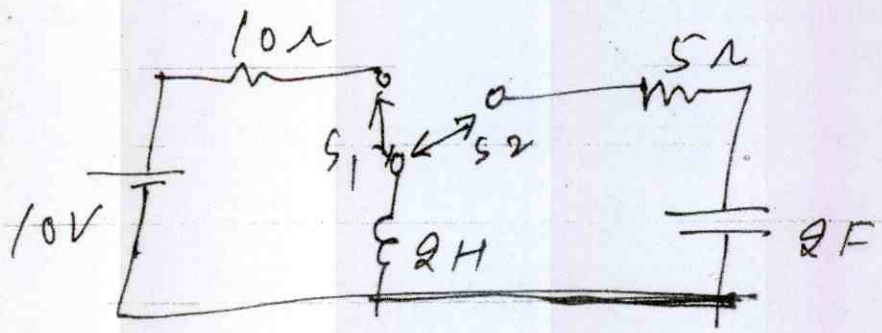
Attempt any Three questions. **(3×10=30)**

1. State maximum power transfer theorem. Find the value of load Z_L to maximum power transfer across it. Also find the value of

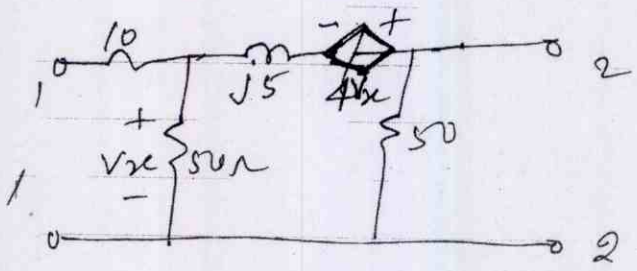


Maximum power accross load ZL.

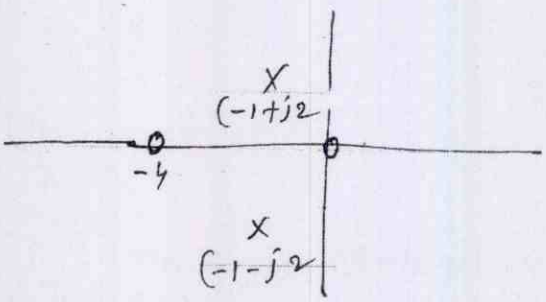
2. Switch S_1 is initially closed and reached steady state condition and switch S_2 is open then at t = 0 $S_1 \rightarrow$ open and $S_2 \rightarrow$ closed. Find the current i_2(t) after time t=0.



3. Find the z-parameter of following two port Network.



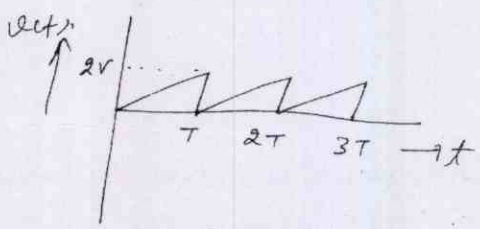
4. The pole zero diagram of an impedance $Z_{22}(s)$ is given below.



if the value of z_2 (s) at s = 1+ j 0.5 is $Z_{22}(s) = 50\angle 30^\circ$ then find the expression of $Z_{22}(s)$.

5. a) Define all type of wave form symmetry. Give an example of quarter wave symmetry.

b) Find the coefficent a_n and b_n in following wave.



Also find its average and rms value.

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3E1223

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3E1223

B.Tech. III-Semester (Main/Back) Examination, January - 2025
Electronic Inst. and control Engineering
3EI4-07 Electronic Devices
EC,EI

Time : 3 Hours **Maximum Marks : 70**

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly. (Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory

(10×2=20)

1 Differentiate between zener breakdown and Avalanche break down?

2. Define mobility and conductivity?

3. Differentiate BJT with FET?

4. Define Electronic Properties of GaAs?

5. What is sputtering?

6. Define transition and diffusion capacitances?

7. Explain the term doping and its need?

8. How the band gap affected with temperature in semiconductors?

9. Differentiate between Resistivity & sheet resistance?

10. How can we differentiate zener diode with normal P-N Junction diode?

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions **(5×4=20)**

1. Explain direct and indirect band gap semicoductors with example?

2. Explain the phenomenon of Base width modulation (Early effect).

3. Explain photolitho graphy in detail?

4. Differentiate thermistors with sensistors and also explain the characteristics of thermistors with applications?

5. How can we define α and β for BJT and what its typical values and give also the relationship between them?

6. Differentiate between intrinsic and extrinsic semi conductors and draw energy band diagram of n-type and p-type extrinsic semi conductor?

7. Explain the working and output characteristics of N-channel Enhancement type of MOSFET?

PART - C

(Descriptive/Analytical/Problem Solving/Design question)

Attempt any Three questions. **(3×10=30)**

1. a) Draw and explain the V-I characteristics of p-n junction diode and show how temperature changes affects the characteristic?

   b) If a intrinsic silicon sample is doped with boron atoms $10^{14}/cm^3$ then conductivity is improved by which factor of this sample at room temperature. (given ni = $1.5\times10^{10}/cm^3$, μh = 500 cm^2/v-sec μe = 1300 cm^2/v-sec?

2. a) Explain the output characteristics of BJT in common emitter configuration?

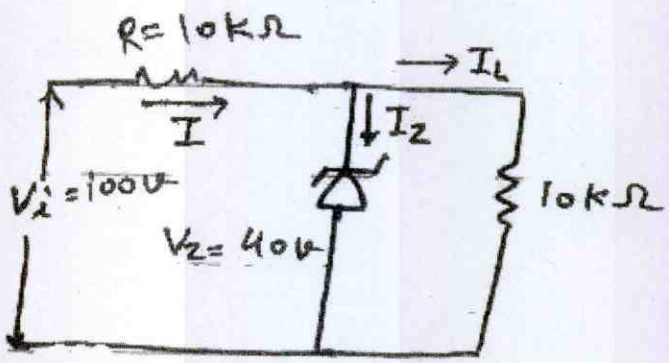
b) Explain Degenerate and non degenerate semiconductors?

3. a) Differentiate photodiode with light emitting diode.

b) In a zener diode circuit given in figure below find:-

i) Output voltage

ii) The current through zener diode



4. a) Enlist the different biasing techniques of Bipolar Junction transistor and explain one of them?

b) Discuss c-v characteristic of MoS capacitor?

5. Write short notes on any two:-

a) Design of Resistors

b) Schottky diode

c) Solar cell

d) Twin tub CMOS Process

e) Eber Moll model of transistor

3E1641

Roll No. _____ [Total No. of Pages : 2

3E1641

B.Tech. III-Sem. (Old Back) Examination, January - 2025
Applied Elect. & Inst. Engineering
3AI2 Electronic Devices and Circuits
EC, EIC, EE, EX, AI, BM

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **Five questions**, selecting **One question** from **each unit**. All questions carry **Equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

UNIT - I

1. Define Fermi energy level. Write the expression for Fermi-Dirac distribution function. What is the effect of temperature on Fermi Dirac distribution function? **(16)**

(OR)

1. State Hall effect. Write the relation between mobility and Hall coefficient. Also find the mobility of electrons in copper if there are 9×10^{28} valence electrons/m^3 and the conductivity of copper is 6×10^7mho/m. **(16)**

UNIT - II

2. With necessary diagrams explain the structure and operation of PN junction diode. Also briefly explain about PN junction capacitance. **(16)**

(OR)

2. Explain the operation of Zener diode and its V-I characteristics. Also explain how Zener diode acts as voltage regulator? **(16)**

UNIT - III

3. Derive and explain voltage and current gain for CE configuration using hybrid models. Also define α, β and γ of the transistor and mention the relation of these terms. **(16)**

(OR)

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3. Analyze and determine the I_C, I_B and dc voltage at the collector of the transistor amplifier circuit shown in Fig.1. **(16)**

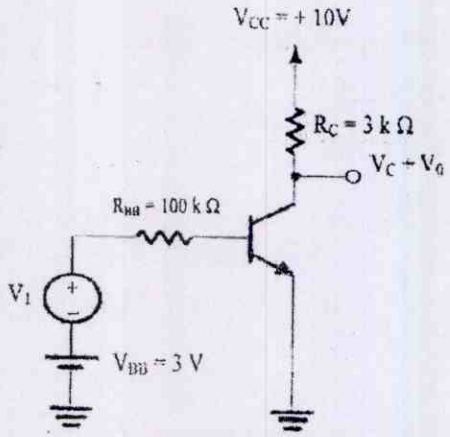

Fig.1

UNIT - IV

4. Explain the Common Drain MOSFET amplifier and derive its input impedance, output impedance and voltage gain. **(16)**

(OR)

4. Explain and differentiate between Enhancement and Depletion MOSFET with V-I characteristics. How FET used as voltage variable resistor. **(16)**

UNIT - V

5. Write short notes on: (a) RC and DC coupled amplifiers, (b) Frequency response of single and multistage amplifier. **(16)**

(OR)

5. Write short notes on: (a) Miller's Theorem and bootstrap configuration, (b) Darlington pair. **(16)**

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3E1101

Roll No. _____ [Total No. of Pages : 2

3E1101

B.Tech. III-Sem. (Back) Examination, January - 2025

Aeronautical Engineering

3AN2-01 Advanced Engineering Mathematics - I

AE, AG, AN, CE, EC, EI, ME, MH, MI

Time : 3 Hours **Maximum Marks : 120**

Min. Passing Marks : 42

Instructions to Candidates:

*Attempt all **Ten questions** from Part A, **Five questions** out of seven questions from Part B and **Four questions** out of five questions from Part C.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. **(10×2=20)**

1. If the interval of difference is unity, then find $\Delta(e^{ax+b})$.
2. Write Gauss forward and backward interpolation formula.
3. What is numerical integration formula in Simpson's '1/3' rule?
4. Write formula for Regula Falsi method to solve an equation $f(x) = 0$.
5. Using Euler's method, find the approximate value of $y(0.2)$, given that $\frac{dy}{dx} = x - y$ and $y = 1$ when $x = 0$.
6. State existence condition of Laplace Transform.
7. If $f(t) = t^2 + \sin t$, then identify the value of $L\{f(t)\}$.
8. Define complex Fourier and inverse Fourier transforms.
9. State convolution theorem for fourier transforms.
10. Find z-transform of the sequence $u_n = \{2, -4, 6, -8\}$.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. **(5×8=40)**

1. Using Lagrange's interpolation formulas find the cubic polynomial, which holds the following values:

x	0	1	2	3
$f(x)$	1	2	1	10

2. Compute the value of the definite integral

$$\int_{0.2}^{1.4} (\sin x - \log_e x + e^x)\, dx$$

by Trapezoidal rule.

3. Using Euler's method, obtain a solution of the equation

$$\frac{dy}{dx} = xy;\ y(1) = 2 \text{ for } x = 1.4, \text{ using } h = 0.2.$$

4. Evaluate $\sqrt{10}$ correct up to 3 deciaml places by using the Newton-Raphson method.

5. Find Laplace transform of $\frac{\sin ax}{x}$. Does the Laplace transform of $\frac{\cos ax}{x}$ exist?

6. Find the complex Fourier transforms of $e^{-|x|}$.

7. Using convolution theorem, evaluate

$$Z^{-1}\left\{\frac{z^2}{z^2 - 4z + 3}\right\}.$$

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions. **(4×15=60)**

1. Use Stirling formula to find y_{28} given:
   $y_{20} = 49225,\ y_{25} = 48316,\ y_{30} = 47236,\ y_{35} = 45926,\ y_{40} = 44306.$

2. Evaluate the following integral by using the Simpson's '1/3' and '3/8' rules:

$$\int_0^1 \frac{x^2}{1+x^3}\, dx.$$

3. By employing the Runge-Kutta method of fourth order, find an approximate value of $y(0.2)$ and $y(0.4)$ by solving the equation $y' + 2xy^2 = 0$ with $y(0) = 1$, h being 0.2.

4. Apply Laplace transform to solve the following equation
   $y'' + 25y = 10\cos 5x,\ y(0) = 2,\ y'(0) = 0.$

5. Using Z-transform, solve the difference equation $6u_{n+2} - u_{n+1} - u_n = 0$, given that $u(0) = 0$, $u(1) = 1$.