3rd Semester - E.C.E. 2025.

APPLIED MATHEMATICS

G-105

Full Mark : 75 **SCTE/NGL/R-2025-I**
Pass Mark : 30
Time : 3 Hours

I. Choose the correct answer. $(1 \times 10 = 10)$

1. A graph in which there is only one edge between pair of vertices is called a
   (a) Simple Graph (c) Multi Graph
   (b) Pseudo graph (d) Weighted Graph
2. A graph with no edge has Chromatic Number
   (a) 1 (b) 2 (c) 0 (d) 3
3. The number of edges in the null graph is
   (a) 0 (b) 1 (c) 2 (d) 3
4. The operator E stands for
   (a) Forward Difference Operator (c) Shift Operator
   (b) Backward Difference Operator (d) Inverse Operator
5. The order of the differential equation $y'' = 1 + y + y^2$ is
   (a) 0 (b) 1 (c) 2 (d) 3
6. The degree of the differential equation $(y')^2 + y^3 + y = 0$ is
   (a) 0 (b) 2 (c) 1 (d) 3
7. The differential equation $(x^2 - ay)dx - (ax - y^2)dy$ is exact.
   (a) True (b) False
8. The number of partitions of 4, $p(4)$ is
   (a) 2 (b) 4 (c) 5 (d) 7
9. The degree of the linear recurrence relation $c_0 a_n + c_1 a_{n-1} + c_2 a_{n-2} + \cdots + c_k a_{n-k} = 0$ is
   (a) n (b) k (c) n-k (d) 0
10. The generating function for $1 + x + x^2 + x^3 + \cdots$ is
    (a) $\frac{1}{1-x}$ (b) $\frac{1}{1-2x}$ (c) $\frac{1}{1+2x}$ (d) $\frac{1}{1+x}$

II. Answer the following questions. $(2 \times 8 = 16)$

1. Prove that $E = \Delta + 1$
2. Define a Bipartite graph. Give an example
3. Draw a 3-regular graph
4. Calculate the forward difference for the following data

x	0	2	4	6	8
y	5	9	6	20 9	50 1

5. Define interpolati
6. Form the differential equation of the family of curves given by $x^2 + y^2 = 2ax$
7. State the principle of Inclusion and Exclusion
8. Find the closed form for the generating function $0, 0, 1, 1, 1, \ldots$

III. Answer the following questions. $(3 \times 11 = 33)$

1. Approximate the area under the curve $y = f(x)$ between $x = -4$ *and* $x = 2$ using Trapezoidal Rule with $n = 6$ subintervals. A function $f(x)$ is given in the table of values

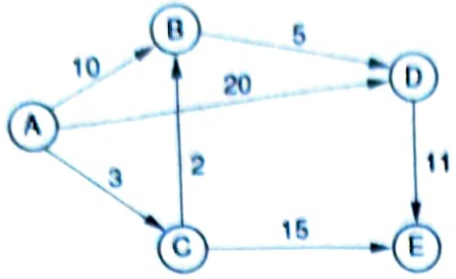
x	-	-	-	-	0	1	2
f(x)	0	4	5	3	10	11	2

2. A rocket is launched from the ground, its velocities were recorded as follows

t	0	10	20	30	40	50
v	0	20 0	60 0	120 0	200 0	300 0

Find the acceleration at $t = 50$

3. Find the shortest path from A to E

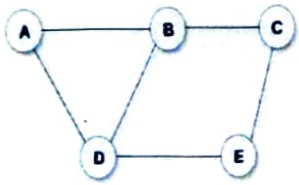


4. Draw the graph represented by

(a) Adjacency matrix $\begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \end{bmatrix}$

(b) Incidence matrix $\begin{bmatrix} 1 & 1 & 1 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 & 1 \end{bmatrix}$

5. Find the number of vertices, the number of edges and degree of each vertex A, B, C, D, E of the following graph



6. Find the generating function for the sequence $1, a, a^2, a^3, \ldots$. where a is a fixed constant

7. Using Lagrange's interpolation formula find the value of y corresponding to $x = 10$ from the following table

x	5	6	9	11
y	12	13	14	16

8. Solve the linear differential equation $\frac{dy}{dx} + 3y = e^{-2x}$

9. Solve $(xy^2 + x)dx + (yx^2 + y)dy = 0$ using variable separable Method

10. Find the first four terms of the recurrence relation

$a_k = 2a_{k-1} + k$, for all integers $k \geq 2, a_1 = 1$

11. Use generating function to find the number of ways to select r objects of n different kinds if at least one object of each kind is selected.

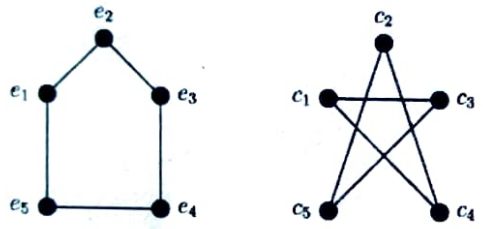
IV. Answer the following questions: **$(4 \times 4 = 16)$**

1. Using Newton's forward interpolation formula find the cubic polynomial which takes on the following values

x	0	1	2	3
y	1	2	1	10

Also find $f(1.5)$

2. Show that the given pairs of graphs are isomorphic



3. Solve $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 9y = 5e^{3x}$

4. Use generating function to solve the recurrence relation

$$a_n = 3a_{n-1} + 2\,;\, a_0 = 1$$

FUNDAMENTALS OF PCMEM

L-300

Full Mark : 75 **SCTE/NGL/R-2025-I**

Pass Mark : 30

Time : 3 Hours

PART-A (ENGINEERING MECHANICS)

(Question 1 to 4 carries 1 mark each)

1. Define Centre of gravity.
2. The Centre of Gravity of a triangle is located .....of lines drawn from each vertex to the midpoint of the opposite side.
3. Define frictional force.
4. Define coefficient of friction.

(Question 5 to 10 carries 2 marks each)

5. State an analytical method to find the Centre of Gravity.
6. Find the centroid of a triangle with vertices at (2,1), (5,4), and (8,2).
7. State Perpendicular Axis Theorem.
8. Write any two laws of Friction.
9. Define screw jack and draw the neat diagram of Screw jack.
10. Define wheel and Axle of a simple machine.
11. Explain in brief any three methods of finding the centre of gravity. 3

PART-B (PHYSICS)

1. Define velocity. 1

(Question 2 to 10 carries 2 marks each)

2. Define scalars and vectors. Give one example each.
3. Define work and power.

4. A force of 10 N moves an object 5 m in 2 seconds. Calculate the power.
5. Define poisson's ratio.
6. Briefly explain the stress-strain curve.
7. Define time period and frequency of a simple harmonic motion.
8. A simple harmonic motion is represented by y=0.30 sin (500 t +0.50), where 'y' and 't' are in millimeter and seconds respectively. Calculate the frequency.
9. Write the inverse square law of magnetism.
10. Define electrostatic induction.

OR

Define electrostatic conduction.

PART-C (MATHEMATICS)

I. Multiple Choice Questions: **(2 X 1 =2)**

1. The derivative of x^n is-
   i. nx ii. x iii. nx^{n-1} iv. 1
2. The value of ${}^4P_0$
   i. 1 ii. 4 iii. 0 iv. 4!

II. Answer the following questions: **(4 X 2 = 8)**

1. Expand $(1+x)^{-1}$ up to four terms.
2. Evaluate $\lim_{x\to\sqrt{2}} \frac{x^4-\sqrt{2}^4}{x-\sqrt{2}}$.
3. Differentiate $log(tanx)$.
4. Integrate $e^{cosx}sinx$ with respect to x.

III. Answer the following questions: **(3 X 3 = 9)**

1. Using first principle, find the differential coefficient of sinx.
2. Find the partial derivatives of x^2y+3xy^4.
3. Evaluate $\int x^2e^x\,dx$.

PART – D (CHEMISTRY)

I. Multiple Choice Questions: **(4 X 1 =4)**

1. The substance that gives out hydroxyl ion in water is called

   i. Acid ii. Base iii. Salt iv. Electrolyte

2. Which is an example of acidic refractories?

   i. Alumina ii. Magnesia iii. Zirconia iv. Lime

3. The most commonly used semiconductor in industries is

   i. Cadmium ii. Germenium iii. Silicon iv. Selenium

4. The purest form of iron is

   i. Steel ii. Pig iron iii. Cast iron iv. Wrought iron

II. Answer the following questions: **(4 X 2 = 8)**

1. Define pH of a solution. Write the pH scale.
2. Write two important properties of Portland cement.
3. Define corrosion.
4. Write two important functions of pigment.

III. Answer the following questions: **(2 X 3 =6)**

1. Classify Acid, Base and Salt with examples.

   (OR)

   Write three important properties of refractories.

2. Write two important properties of cast iron, wrought iron and steel.

   (OR)

   Explain three methods of preventive measures against corrosion.

COMMUNICATION ENGINEERING – I

ECE-406

Full Marks : 75 **SCTE/NGL/R-2025-I**

Pass Marks : 30

Time : 3 Hours

SECTION – 1

1. Define bandwidth in a system with relation to gain. **(1)**
2. Why is radio communication considered more refined as compared to telephony. **(2)**
3. A multistage amplifier employs five stages each of which has a power gain of 30. What is the total power gain of the amplifier in dB. **(2)**
4. Explain the general principles of radio broadcasting, transmission and reception. **(3)**
5. Write a short note on the concept of channel- noise in a basic communication system. **(4)**

SECTION – 2

1. Identify the two sideband frequencies of amplitude modulation? Write its mathematical equation. **(1)**
2. Draw and label the frequency spectrum of sideband frequencies and bandwidth for amplitude modulation. **(2)**
3. Sketch and define Phase Modulation. **(2)**
4. Determine the sideband frequencies, amplitude of sideband and bandwidth for an amplitude modulated waveform with 800 MHz carrier frequencies and 15 KHz baseband signal? Assume modulation index of 0.5. **(3)**
5. Discuss the reason on how modulation helps in reducing the height of the antenna. **(4)**

SECTION – 3

1. Write the mathematical representation of carrier voltage and baseband voltage. **(1)**
2. Give an example of the types of amplifiers used for high level modulation. **(1)**

3. Consider the message signal V(m) = 20sin(2πt) and the carrier wave V(c)= 50sin(2π50t). Obtain an expression for the resulting AM wave for 75% modulation. **(2)**
4. Explain the working of a simple transistorized Amplitude Modulated circuit. **(3)**

SECTION – 4

1. How is the bandwidth of a FM system determined. **(1)**
2. Define the term '*Deviation ratio*'. **(1)**
3. Compare the difference between FM and AM. **(2)**
4. Discuss in brief the observations made using Bessel's function related to frequency spectrum of FM wave. **(3)**

SECTION – 5

1. Define Demodulation. **(1)**
2. State the functions of an amplitude limiter in FM circuit. **(1)**
3. State the outcomes when a modulated wave is fed directly to the speaker. Give reasons for your answer. **(3)**
4. Draw the diode detector circuit and explain its action. **(4)**

SECTION – 6

1. Name the frequency range used in ground wave propagation. **(1)**
2. In which layer of the Ionosphere wave propagation is absent during night time? **(1)**
3. Illustrate with suitable example, the basic principle of traverse electromagnetic radiation in free space. **(2)**
4. Explain the function of a waveguides at very high frequency applications. **(2)**
5. Explain the phenomena of interference effect when direct and reflected wave is transmitted from a source to its destination. **(3)**

SECTION – 7

1. Determine the length and radiation pattern of an elementary doublet antenna. **(1)**
2. State the basic difference between electrically small and large loop antenna. **(1)**

3. Explain briefly the two basic considerations of an antenna. **(2)**
4. Explain the functions and radiation pattern of an elementary doublet antenna. **(3)**

SECTION – 8

1. Name the frequency range at which microwave operates? **(1)**
2. Explain this statement "Transit time limit the operation of conventional tube at high frequency" **(2)**
3. Explain how an inter electrode capacitance effect the conventional tubes at microwave frequencies above 1 GHz. **(2)**
4. Draw the neat schematic diagram and Applegate diagram explaining the process of operation of two cavity Klystron amplifier. **(3)**
5. Describe the path of electrons in a Magnetron when electric field and magnetic fields are applied simultaneously. **(4)**

CIRCUITS & NETWORKS

ECE-401

Full Marks : 75 **SCTE/NGL/R-2025-I**

Pass Marks : 30

Time : 3 Hours

I. Choose the correct answer: **(1x10=10)**

1. A law that defines the relationship between current, voltage and resistance within a circuit is _____.
   a) Ohms Law b) Current Law
   c) Voltage Law d) Kirchoff Law

2. With increase in frequency of an A.C. supply, the inductive reactance
   (a) Decreases
   (b) Increases directly with frequency
   (c) Increases as square of frequency
   (d) Decreases inversely with frequency

3. Thevenin's equivalent resistance may be called
   a) Resistance across the load
   b) Resistance across the open path of the disconnected load
   c) Source resistance
   d) Load resistance

4. What does a resistive load provide in a power triangle?
   a) Apparent power b) Reactive power
   c) True power d) Impedance

5. A capacitor value of 1μF is equivalent to
   a) $1x10^{-3}$ F b) $1x10^{-4}$F c) $1x10^{-5}$F d) $1x10^{-6}$F

6. What is the line voltage if the phase voltage is 415V in Delta connection?
   a) 415V b) 207.5V c) 240V d) 719V

7. What is the first step of mesh analysis?
   a) Each closed type loop is assigned a loop current
   b) Kirchhoff's 2nd law is applied for each loop
   c) Solve the equation to get loop current value
   d) Each node is assigned with arbitrary voltage

8. At resonance frequency the impedance in series LCR circuit is
   a) Maximum b) Minimum c) Zero d) Infinity

9. In an LCR series circuit with AC source, as the frequency of the source is slightly increased from a very low value, the reactance of the
   a) Inductor increases b) Resistor increases
   c) Capacitor increases d) Circuit increases

10. If a circuit operates with a constant current or voltage source, then the circuit is called a circuit.
   a) AC circuit b) DC circuit
   c) ADC circuit d) DAC circuit

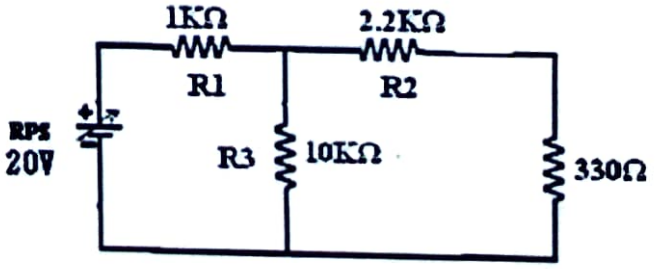
II. Answer the following questions:

1. Find the equivalent capacitance for the system of capacitors 3 pF, 5 pF, and 10 pF added in parallel combination. (2)
2. Write the formula to calculate energy of Inductor and Capacitor in DC circuit. (2)
3. Write the generalised mathematical expression of voltage and current of a sinusoidal waveform. (2)
4. List the formula of Real power and Reactive power (2)
5. Calculate the reactance of a 100mH inductor at DC. (2)
6. Define a resonant circuit. (2)
7. Define conductance of a parallel LCR circuit. (2)
8. In a Thevenin's equivalent circuit, V_{th} = 23.5V, and R_{th}= 30Ω and the load resistor R_L=4Ω. Calculate the value of current through the load resistor. (3)
9. At what frequency does a 350 mH inductor have 4.7 kΩ of reactance? Write the formula for solving this, in addition to calculating the frequency. (3)

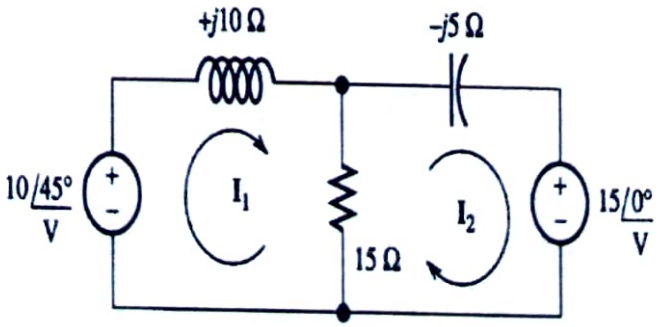
10. Multiply $12\angle 56.3^\circ$, $4\angle 11.2^\circ$ and $7\angle 63.1^\circ$ and convert to rectangular form. (3)
11. A delta connected load has 10Ω, 22Ω and 33Ω in each arm. Obtain the Star connected equivalent of this network. (3)
12. The input power to a 3-phase a.c. motor is measured as 5kW. If the voltage and current to the motor are 400V and 8.6A respectively, determine the power factor of the system? (3)

III. Answer the following questions:

1. Define impedance of RC circuit. With a 7Ω resistor and a 10Ω capacitance reactance, what is the total impedance? (2+2)
2. A 440V, 50 Hz AC source supplies a series LCR circuit with a capacitor and an inductor. If the coil has 100 mΩ resistance and 15 mH inductance, then at a resonance frequency of 50 Hz, what is the value of the capacitor? (4)
3. A symmetrical 3phase, 400V supplies a balanced Delta connected load. The current in each branch circuit is 11A and the phase angle is 30° lagging. Find the a) Line current b) Total power. (4)
4. List the procedures for applying NORTON's Theorem. Solve the given circuit and derive its Norton's Equivalent circuit. (2+4)

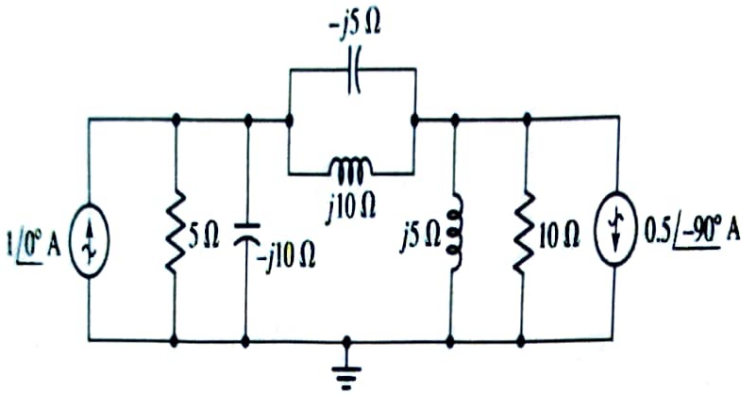


5. For the given AC network, Using MESH method form the matrix and find the loop currents I_1 and I_2. (2+4)



6. A voltage of 215V at 70 Hz is applied across a non-inductive resistor connected in series with a capacitor. The current is 3.7 A. The power loss in resistor is 96.8 Watts. Determine the resistance, impedance, capacitive reactance and capacitance. (6)

7. Using Nodal method in the given AC network, redraw the given circuit as per the procedure, form the matrix and determine the node voltages. (2+4)



DIGITAL ELECTRONICS

ECE-404

Full Mark : *75* **SCTE/NGL/R-2025-I**

Pass Mark : *30*

Time : *3 Hours*

A. Multiple Choice Question **(15 X 1 = 15)**

1. A digital circuit receives an input in BCD code (1001 0101). What is the equivalent decimal number?
   a) 85 b) 95 c) 105 d) 75

2. What will be the binary representation of the octal number $(57)_8$?
   a) 101111 b) 001111 c) 101110 d) 101011

3. Which gate can be used to realize any Boolean function without using other types of gates?
   a) AND b) OR c) NAND d) XOR

4. What is the output of a XOR gate when both inputs are 1?
   a) 0 b) 1 c) Both d) Undefined

5. Which of the following combinational circuits adds three binary digits and produces a sum and a carry?
   a) Half Adder b) Full Adder
   c) Binary Parallel Adder d) Multiplexer

6. How many select lines are required in a multiplexer of 8 input lines?
   a) 2 b) 3 c) 4 d) 8

7. A multiplexer is called a "data selector" because?
   a) It performs arithmetic operations on data
   b) It selects one input from multiple data inputs as its output
   c) It stores data temporarily like memory
   d) It generates data from binary numbers

8. What is the output of a half subtractor when $A = 1$ and $B = 0$?
   a) Difference = 0, Borrow = 0 b) Difference = 1, Borrow = 0
   c) Difference = 1, Borrow = 1 d) Difference = 0, Borrow = 1

9. In a T Flip-Flop, what does the letter T stand for?
   a) Transfer b) Toggle c) Timer d) Trigger

10. Which shift register can perform both serial and parallel operations?
    a) SISO b) PIPO
    c) Universal shift registers d) Buffer register

11. The main function of a shift register is:
    a) Data storage b) Data shifting
    c) Arithmetic operation d) Both (a) and (b)

12. Which of the following is a programmable logic device used for implementing combinational logic?
    a) RAM b) ROM c) PLA d) FIFO

13. Which component is used in a DAC to convert digital signal to analog?
    a) Capacitor b) Resistor c) Inductor d) Diode

14. Which ADC type is fastest in converting analog to digital?
    a) Flash ADC b) Successive approximation ADC
    c) Single slope ADC d) Dual slope ADC

15. Why is an R-2R ladder DAC preferred over a binary weighted DAC?
    a) It is cheaper and simpler to build
    b) It is slower
    c) It requires more resistors
    d) It cannot be used with microcontrollers

B. Short Answer Type Question. **(15 X 2 = 30)**

1. What are Weighted Codes? Give one example.
2. Why is the "Gray Code" considered a self-checking code?
3. Define maxterms and minterms.
4. Why are NAND and NOR gates called universal gates?
5. Briefly explain why are XOR and XNOR gates called arithmetic gates?
6. Define Combinational Circuits with an example.
7. Give the truth table of a 4-to-2 Encoder.
8. Describe the operation of a 3-bit binary parallel adder
9. List any two differences between asynchronous and synchronous counters.
10. Why is the master–slave flip-flop used instead of a simple JK flip-flop?
11. Design a D Flipflop using JK Flip Flop.
12. Explain how a Shift Register can be used as a Buffer Register
13. Design a 2-bit Parallel-in Parallel-out (PISO) shift register
14. Explain why RAM is called volatile memory
15. Name two practical applications of a DAC.

C. Long Answer Type Questions **(10 x 3 = 30)**

1. Perform binary subtraction using 2's complement method: Subtract $(10101)_2 - (1101)_2$.
2. Differentiate between Sum of Product (SOP) and Product of Sum (POS) forms with one Boolean example each.
3. Simplify the Boolean function using Boolean algebra:
   $F(A, B, C) = A \cdot B + A \cdot B' + A' \cdot C$
4. Realize XOR and XNOR gate using only NAND gates (draw the logic diagrams).

5. Use a K-map to simplify: F (A, B, C) =Σ (1,2,3,5,7)
6. Demonstrate the working of a BCD to seven-segment display decoder.
7. Design and explain the working of a 4-to-1 Multiplexer with the help of its truth table.
8. Write a short note on the following.
   a. Ring counter
   b. Modulo Counter
   c. Johnson Counter
9. Draw the block diagram of a FIFO memory and explain how data is written and read.
10. Explain with simple steps how a binary weighted DAC converts digital input to analog output.

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FUNDAMENTAL OF ELECTRICAL AND ELECTRONICS ENGINEERING

G-207

Full Mark : 75 **SCTE/NGL/R-2025-I**
Pass Mark : 30
Time : 3 Hours

A. Multiple Choice Question. **(9×1=9)**

1. The unit of conductance is.
   a) Ohm b) Siemens c) Henry d) Farad
2. The slope of a V-I graph of a resistor represents.
   a) Power b) Current
   c) Resistance d) Conductance
3. In any closed electrical circuit, the algebraic sum of all voltages is.
   a) Equal to the total current
   b) Equal to zero
   c) Equal to total resistance
   d) Equal to total power
4. The time taken for one complete AC cycle is called.
   a) Frequency b) Period
   c) Phase d) Wavelength
5. The standard frequency in India is
   a) 50 Hz b) 60 Hz c) 120 Hz d) 100 Hz
6. A PN junction acts as a short circuit when.
   a) Reverse biased b) Forward biased
   c) Open circuited d) None
7. The device which converts AC to DC is called.
   a) Inverter b) Rectifier c) Amplifier d) Oscillator
8. Decimal number 13 in binary is.
   a) 1100 b) 1101 c) 1110 d) 1011
9. The logic expression $A + \bar{A}B$ simplifies to.
   a) B b) A + B c) 1 d) A

B. Short Answer question **(8×2=16)**

1. Define Voltage, current and resistance.
2. State Ohm's law and its mathematical form.
3. Define peak value and rms value of AC.
4. List two real life application of rectifiers.

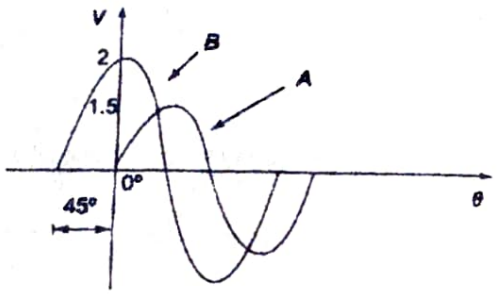
5. State the condition that allows a diode to conduct current.
6. Draw the symbol of an NPN and PNP transistor.
7. Write the truth table of a NOR gate.
8. State De Morgan's first theorem.

C. Answer the following questions **(5×3=15)**

1. List one use of conductor, semiconductor and insulator.
2. Explain series and parallel connection of resistors with the formula for equivalent resistance.
3. A 6 V battery is connected to a 3 Ω resistor. Find the power dissipated through the resistor.
4. Sketch and describe one complete cycle of a single-phase AC waveform.
5. Explain the working of an AND gate with truth table.

D. Answer the following questions **(7×5=35)**

1. Draw the Phasor diagram to represent the two sine waves shown in the figure and need of phasor diagram.



2. Explain the construction, operation of a Zener diode.
3. Explain the working of a full-wave bridge rectifier.
4. Draw and explain the working of a JFET
5. Using proper figure explain the input and output characteristics of a CE-configured transistor.
6. Draw the truth table and logic symbol for AND and NOR gate.
7. Minimise the Boolean function F(A,B,C,D)= Σ(0,2,5,7,8,10,13,15) using a 4-variable K-map.

ELECTRONICS DEVICES AND CIRCUITS – I ECE402

Full Marks : 75 **SCTE/NGL/R-2025-I**

Pass Marks : 30

Time : 3 Hours

PART A – (12×1 = 12 Marks)

1. Resistivity of a semiconductor lies in between _____ and insulators.
   a. capacitors b. inductors c. voltage d. conductors

2. With the addition of pentavalent impurity to a semiconductor, _____ semiconductor is obtained.
   a. n-type b. p-type c. *npn* d. *pnp*

3. The addition of pentavalent impurity to a semiconductor creates _____
   a. holes b. Free electrons
   c. electric current d. potential difference

4. If the applied voltage pushes the conventional current in the direction o arrow, then the diode is _____
   a. open circuit b. damages
   c. forward biased d. reverse biased

5. A transistor has _____ *PN* junctions.
   a. one b. two c. three d. four

6. For proper operation of transistor, base-emitter junction should be _____ and collector-base junction _____
   a. reverse biased, reverse biased b. forward biased, forward biased
   c. forward biased, reverse biased d. reverse biased, forward biased

7. The input and output voltages of a common emitter transistor amplifier ar
_____ out of phase.
a. 60° b. 120° c. 180° d. 360°

8. For which value of time constant, the *RC* circuit is said to reach transient period?
a. 2T b. 3T c. 4T d. 5T

9. In phase shift oscillators, generally _____ *RC* sections are used.
a. one b. two c. three d. seven

10. Wein bridge uses _____ feedback.
a. positive b. negative c. only (a) d. both (a) & (b)

11. The output voltage which has all the positive half cycles removed is called _____
a. positive clamper b. positive clipper
c. negative clamper d. negative clipper

12. A _____ circuit essentially adds a DC component to the signal.
a. clamper b. clipper c. filter d. both (a.) & (b.)

PART B – (8×2 = 16 Marks)

1. What is a zener diode?
2. Draw the symbol of *npn* and *pnp* transistor and specify the leads?
3. What is the significance of arrow in the transistor symbol?
4. What do you understand by single stage amplifiers?
5. Define steady state period in *RC* circuit?
6. Define an *RC* integrator circuit?
7. Write the mathematical formula to determine the frequency of oscillation using Wein bridge oscillators?

8. What is known as a positive clipper circuit?

PART C – (9×3 = 27 Marks)

1. Draw the diagram of energy band diagram comparison between insulator semiconductors and conductors.
2. What do you understand by intrinsic and extrinsic semiconductors?
3. Describe the half wave rectifier using a diode.
4. For a Common Emitter DC load line output characteristics; define the cut o region, saturation region and active region?
5. Derive an expression for the gain of negative feedback amplifier?
6. Explain the operating principle of *RC* charging circuit with the help of curves
7. What do you understand by damped and un-damped electrical oscillations?
8. With neat diagram explain the action of a positive clamper?
9. Analyze with the help of circuits and waveforms, the working principles of negative clipper?

PART D – (4×5 = 20 Marks)

1. Discuss the behavior of a *PN* junction under forward and reverse biasing?
2. Draw the input and output characteristics of *CB* connection. What do yc infer from these characteristics?
3. Explain the operation of a *R-C* coupled transistor amplifier?
4. With a neat diagram, explain the action of Phase shift oscillators?