

**I B. Tech I Semester Regular Examinations, January-2024**  
**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

(Common to CE, ME, ECE, IT, AME, Mining, Robotics, Agri E, ECE-Allied, CSE- Allied)

Time: 3 hours

Max. Marks: 70

*Note: 1. Question paper consists of two parts (Part-A and Part-B)*

*2. All the questions in Part-A is Compulsory*

*3. Answer ONE Question from each Unit in Part-B*

**PART –A (10 Marks)**

- |    |    |  |      |
|----|----|--|------|
| 1. | a) | What is meant by a closed circuit?                     | [1M] |
|    | b) | State Kirchoff's voltage law.                          | [1M] |
|    | c) | What is the function of a D.C motor?                   | [1M] |
|    | d) | What is meant by electric shock?                       | [1M] |
|    | e) | Write the function of electrical measuring instrument. | [1M] |
|    | f) | Draw PN junction of a diode.                           | [1M] |
|    | g) | Write two benefits of Nano electronics.                | [1M] |
|    | h) | Write the function of a capacitor filter.              | [1M] |
|    | i) | Draw the symbols of OR and NOT gates.                  | [1M] |
|    | j) | Write the representation of decimal system.            | [1M] |

**PART – B (60 MARKS)**

**Basic Electrical Engineering**

**UNIT-I**

- |    |  |       |
|----|--|-------|
| 2. | State and prove super position theorem for an electrical 'T' network excited with two equal D.C sources. | [10M] |
|----|--|-------|

**(OR)**

- |   |    |   |      |
|---|----|---|------|
| 3 | a) | Draw impedance triangle and explain the resultant impedance with relevant relations.  | [5M] |
|   | b) | An alternating voltage is having the equation as $V=167.8\sin 314t$ . Find the R.M.S voltage, frequency and the instantaneous voltage when $t=3.7\text{ms}$ ? | [5M] |

**UNIT-II**

- |    |  |       |
|----|--|-------|
| 4. | Draw the construction diagram and explain in detail about the working principle of single phase transformer. | [10M] |
|----|--|-------|

**(OR)**

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|----|----|--|------|
| 5. | a) | Elaborate the essential features of indicating instruments with diagrams.  | [5M] |
|    | b) | Find the e.m.f generated by a 6 pole D.C generator having 440 conductors and driven at a speed of 1400 r.p.m connected as lap and wave windings? The flux per pole is 0.032wb. | [5M] |

**UNIT-III**

- |    |    |  |      |
|----|----|--|------|
| 6. | a) | Compare the non earthed and earthed electrical networks with advantages.         | [5M] |
|    | b) | Explain the electricity bill calculation of a domestic consumer with an example. | [5M] |

**(OR)**

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|----|--|-------|
| 7. | Draw neat diagram and explain the over load protection by using miniature circuit breaker. | [10M] |
|----|--|-------|

**Basic Electronics Engineering**

**UNIT-I**

- |    |    |   |      |
|----|----|---|------|
| 8. | a) | Discuss in detail about the advantages and disadvantages of electronic components and switches. | [5M] |
|    | b) | Derive and analyze the common base characteristics of a transistor configuration.               | [5M] |



**(OR)**

9. a) Draw and explain the junction break down characteristics of a zener diode. [5M]  
b) A diode with 720mW maximum power dissipation at 25<sup>0</sup>C has a 5.2mW/<sup>0</sup>C derating factor. If the forward voltage drop remains constant at 0.8V, find the maximum forward current at 25<sup>0</sup>C and at 70<sup>0</sup>C. [5M]

**UNIT-II**

10. Describe the working of a full wave bridge rectifier with output waveforms. [10M]

**(OR)**

11. a) Write briefly about the requirements and specifications of DC power supply. [5M]  
b) Summarize the outputs and outcomes of a zener voltage regulator circuit. [5M]

**UNIT-III**

12. a) Describe the functions of registers and counters with an example. [5M]  
b) Find the decimal numbers of the following binary numbers. [5M]  
i) 110100      ii) 110111      iii) 1111111

**(OR)**

13. a) Draw the basic circuit diagram and explain the operation of Flip-flop. [5M]  
b) State and prove associative and distributive laws of Boolean algebra with example. [5M]

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*3. Answer ONE Question from each Unit in Part-B*

**PART –A (10 Marks)**

- |    |    |   |      |
|----|----|---|------|
| 1. | a) | What is meant by an open circuit?                               | [1M] |
|    | b) | State Kirchoff's current law.                                   | [1M] |
|    | c) | Write the function of a D.C generator.                          | [1M] |
|    | d) | What is meant by transformer core?                              | [1M] |
|    | e) | What is the indication of power rating of electrical equipment? | [1M] |
|    | f) | What is meant by a vacuum tube?                                 | [1M] |
|    | g) | Indicate the terminals of diode symbol.                         | [1M] |
|    | h) | Draw the output voltage wave of a rectifier.                    | [1M] |
|    | i) | Draw the symbols of OR and NOR gates.                           | [1M] |
|    | j) | Write about the junctions of a bipolar junction transistor.     | [1M] |

**PART – B (60 MARKS)**

**Basic Electrical Engineering**

**UNIT-I**

- |    |    |  |       |
|----|----|--|-------|
| 2. |    | State and prove super position theorem for an electrical 'T' network excited with two unequal D.C sources.   | [10M] |
|    |    | <b>(OR)</b>  |       |
| 3. | a) | Draw power triangle and explain the resultant impedance with relevant relations.   | [5M]  |
|    | b) | An alternating current has an effective value of 214A. If its frequency is 50Hz, determine the average value and write the expression for the current. | [5M]  |

**UNIT-II**

- |    |    |   |       |
|----|----|---|-------|
| 4. |    | Draw the construction diagram and explain in detail about the working principle of a DC electrical machine having rotation as output.   | [10M] |
|    |    | <b>(OR)</b>   |       |
| 5. | a) | Draw the diagram and explain the working principle of permanent magnet moving coil instrument.  | [5M]  |
|    | b) | A wave connected armature winding has 19 slots with 44 conductors per slot. If the flux per pole is 0.066wb and the number of poles is 8, calculate the speed at which the generator should run to give 564V? Calculate the speed if the armature is lap connected. | [5M]  |

**UNIT-III**

- |    |    |   |      |
|----|----|---|------|
| 6. | a) | Elaborate different types of earthing methods and disadvantages.            | [5M] |
|    | b) | Write briefly about the essential requirements of hydel power generation.   | [5M] |
|    |    | <b>(OR)</b>   |      |
| 7. | a) | Differentiate conventional and non-conventional energy resources.           | [5M] |
|    | b) | How to calculate the electricity bill for domestic consumer? Give examples. | [5M] |



**Basic Electronics Engineering****UNIT-I**

8. a) Draw and explain the forward and reverse characteristics of a PN junction diode. [5M]  
b) Derive and analyze the common emitter characteristics of a transistor configuration. [5M]

**(OR)**

9. a) Describe the reverse break down operation of a zener diode with characteristics. [5M]  
b) Find the maximum and minimum levels of  $V_F$  for a germanium diode with  $V_F=0.4V$  at  $20^{\circ}C$  when operated over a temperature range of  $12^{\circ}C$  to  $88^{\circ}C$ . Find the device dynamic resistances at the temperature extremes if  $I_F$  is  $17mA$ . [5M]

**UNIT-II**

10. Draw circuit diagram and explain the working principle of zener voltage regulator. [10M]

**(OR)**

11. a) Write briefly about the characteristic features of capacitor filter. [5M]  
b) List out the components and write the functions of public address system. [5M]

**UNIT-III**

12. a) Explain the functionality of sequential circuits with block diagram. [5M]  
b) Find the decimal number of the following binary numbers. [5M]  
i) 110011.11001 ii) 1010.1100 iii) 1110.1011

**(OR)**

13. a) Derive and explain the truth table of XNOR gate with circuit diagram. [5M]  
b) State and prove commutative, associative laws of Boolean algebra with an example. [5M]

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**PART -A (10 Marks)**

1. a) What is meant by a series circuit? [1M]
- b) Draw the indications of DC and AC supply voltages. [1M]
- c) Define e.m.f of a D.C generator. [1M]
- d) Define tariff of electrical energy. [1M]
- e) What is meant by controlling torque of an instrument? [1M]
- f) What is meant by a PN junction? [1M]
- g) Write two benefits of electronic circuits. [1M]
- h) Draw the output current of a full wave rectifier. [1M]
- i) Draw the symbols of NOT and AND gates. [1M]
- j) Write the representations of binary system. [1M]

**PART - B (60 MARKS)**

**Basic Electrical Engineering**

**UNIT-I**

2. Derive the expressions and analyze the voltage-current relationships of R,L,C elements with waveforms. [10M]
- (OR)**
3. a) Derive and explain the average value of an alternating current with necessary waveforms. [5M]
  - b) A 50Hz sinusoidal voltage is given as  $e=212\sin\omega t$  is supplied to a pure resistance of 24 ohms. Write the equation for the current and power? Determine the R.M.S current and average power? Also draw the phasor diagram. [5M]

**UNIT-II**

4. Draw the construction diagram and explain in detail about the working principle of a synchronous generator. [10M]
- (OR)**
5. a) Draw the diagram and explain the working principle of attraction type moving iron instrument. [5M]
  - b) A 44kVA, 1000/415V, 50Hz single phase transformer has 88 turns on the primary. Find i) The number of turns on the secondary, ii) The full load primary and secondary currents and iii) The maximum value of the flux. [5M]

**UNIT-III**

6. a) Write briefly about the two part electricity tariff with an example. [5M]
  - b) Summarize the safety precautions to prevent the electric shock. [5M]
- (OR)**
7. Draw the layout diagram and explain in detail about the working principle of wind power generation. [10M]



**Basic Electronics Engineering****UNIT-I**

8. a) List out and explain various parameters of a diode. [5M]  
b) Derive and analyze the common collector characteristics of a transistor configuration. [5M]

**(OR)**

9. a) Draw the symbol and discuss about various parameters of a Zener diode. [5M]  
b) A diode with a 1.2W maximum power dissipation at 22°C has a 4mW/°C derating factor. Find the maximum power that may be dissipated in the diode when its temperature is 78°C. [5M]

**UNIT-II**

10. By using the block diagram, explain in detail about the working of public address system. [10M]

**(OR)**

11. a) Explain the frequency response of common emitter RC coupled amplifier with relevant relations. [5M]  
b) List out the components and explain briefly about the electronic instrumentation system. [5M]

**UNIT-III**

12. a) Derive the output and analyze the half adder circuit with diagram. [5M]  
b) Find the binary form representation of the following decimal numbers. [5M]  
i) 22.5 ii) 12.725 iii) 0.8657

**(OR)**

13. a) Derive and explain the truth table of XOR gate with circuit diagram. [5M]  
b) Explain in detail about the basic properties of Boolean algebra associated with 'OR' operation. [5M]

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**PART -A (10 Marks)**

- |    |    |   |      |
|----|----|---|------|
| 1. | a) | Define phase angle of AC quantities.          | [1M] |
|    | b) | What is the output of an alternator?          | [1M] |
|    | c) | What is meant by a parallel circuit?          | [1M] |
|    | d) | Define the 'unit' of electricity billing.     | [1M] |
|    | e) | Write the limitations of ohm's law.           | [1M] |
|    | f) | Write the main features of PN junction diode. | [1M] |
|    | g) | Draw the symbol of zener diode.               | [1M] |
|    | h) | What is meant by an amplifier?                | [1M] |
|    | i) | Draw the symbols of NOT and NOR gates.        | [1M] |
|    | j) | Draw the truth table of AND gate.             | [1M] |

**PART - B (60 MARKS)**

**Basic Electrical Engineering**

**UNIT-I**

- |    |    |  |       |
|----|----|--|-------|
| 2. |    | Derive the expressions and analyze the voltage-current relationships of R,L,C elements with phasor diagrams.   | [10M] |
|    |    | <b>(OR)</b>  |       |
| 3. | a) | Derive and explain the root mean square value of an alternating current with necessary waveforms.  | [5M]  |
|    | b) | A coil wire carries simultaneously the instantaneous currents as $i_1=15\sin\omega t$ Amps and $i_2=12\sin(\omega t+60^\circ)$ Amps. Calculate the total current, the total power expended in the coil if the resistance of the coil is 17 ohms and the energy consumed by the coil when the two currents flow through it for 5 hours. | [5M]  |

**UNIT-II**

- |    |    |   |       |
|----|----|---|-------|
| 4. |    | Draw the construction diagram and explain in detail about the working principle of three phase induction motor.   | [10M] |
|    |    | <b>(OR)</b>   |       |
| 5. | a) | Draw the diagram and explain the working principle of repulsion type moving iron instrument.  | [5M]  |
|    | b) | A single phase transformer has 660 turns on the primary and 92 turns on the secondary. If the primary is connected to 3600V supply, calculate the secondary voltage? If the secondary current is 218A find the primary current. | [5M]  |

**UNIT-III**

- |    |    |   |      |
|----|----|---|------|
| 6. | a) | Explain in detail about the advantages and disadvantages of solar power generation systems. | [5M] |
|    | b) | Discuss about the importance of power rating of electrical appliances with an example.      | [5M] |



**(OR)**

7. Draw the layout diagram and explain in detail about the working principle of nuclear, solar power generation. [10M]

**Basic Electronics Engineering****UNIT-I**

8. a) Derive and explain in detail about the DC equivalent circuit of a junction diode. [5M]  
b) A zener diode with  $V_Z=4.7V$  has  $Z_Z$  equal to 24 ohms when  $I_Z=27mA$ . Find the upper and lower limits of  $V_Z$  changes by  $\pm 4mA$ . [5M]

**(OR)**

9. a) Draw the circuit diagram and explain the small signal CE amplifier operation. [5M]  
b) Derive and analyze the forward and reverse bias characteristics of a diode. [5M]

**UNIT-II**

10. With a neat sketch, describe the working of electronic instrumentation system. [10M]

**(OR)**

11. a) Explain the working principle of common emitter RC coupled amplifier with circuit diagram. [5M]  
b) Derive and explain the output voltage waveforms of a full wave rectifier. [5M]

**UNIT-III**

12. a) Explain the generation of BCD code and Gray Code. [5M]  
b) Convert the following decimal number in to base-2 numbers. [5M]  
i) 17      ii) 0.75725      iii) 11.822

**(OR)**

13. a) Explain the properties of hamming code with an example. [5M]  
b) Explain in detail about the basic properties of Boolean algebra associated with 'AND' operation. [5M]

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