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Instructions – (1) All Questions are *Compulsory*.

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Figures to the right indicate full marks.

(5) Assume suitable data, if necessary.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

SECTION - I

1.   **Solve any NINE of the following:**   **18**

a) Draw the single line diagram of electrical power A.C. supply system from generation to distribution level.

b) Define regulation of transformer. Also write its formula.

c) State any two applications of transformers.

d) Compare A.C & D.C measuring instruments in any two aspects.

Marks

e) Draw circuit symbol of the following electrical components:

    i) switch

    ii) socket

    iii) fan

    iv) lamp.

f) Write the meaning of energy audit.

g) Write the working principle of 3 phase squirrel cage induction motor briefly.

h) What is meant by electric heating ? Write any one application of it.

i) Write the classification of lamps with their resting.

j) Write the relationship of line and phase values of voltages and currents of steer connected and delta connected systems.

k) Draw the connection diagram of I ϕ energy motor.

l) State any two applications of capacitor start and run 1 phase induction motor.

m) Give the names of electrical machines used in agro system. (Any two).

n) Draw the connection diagram of:

    i) step up

    ii) step down auto transformer.

2.   **Solve any <u>FOUR</u> of the following:**   **16**

a) Define following electrical terms:

    i) frequency

    ii) time period

    iii) maximum value

    iv) average value.

b) Give constructional details and working principle of digital multimeter with neat sketch.

Marks

c) Derive emf equation of 1 phase transformer.

d) i) State the types of tariff.

   ii) Write the names of different methods of power factor improvement.

e) Why is the single phase induction motor not self starting motor ? Explain.

f) Classify electrical drives based on their speed torque characteristics.

3. **Solve any FOUR of the following:** **16**

a) A circuit consists of resistance R = 20 Ω inductance of 1 = 0.05H. A source voltage of 230 volt, 50 Hz frequency is connected across the series combination of R and L.

   Calculate following:

   i) total circuit current

   ii) total circuit impedance

   iii) voltage across resistor

   iv) voltage across inductor.

b) With a neat sketch explain the working of a MI voltmeter.

c) Explain the working principle of a 1 φ transformer with a neat sketch.

d) Discuss how MCB & ELCB are used for the protection of electrical systems against the faults of the system.

e) Describe the working of direct on line starter with neat sketch used for a 3 φ induction motor.

f) State any four factors for the selection of motors for different electrical drives.

Marks

SECTION - II

4. **Attempt any SEVEN of the following:** **14**

    a) List any two application of capacitor.

    b) Sketch the symbol of SCR. Name different terminals.

    c) Draw transistor output characteristics in common emitter configuration.

    d) State the need of voltage regulator circuit.

    e) Define negative logic with respect to digital circuit.

    f) Sketch V-I characteristics of Si and Ge PN junction diode on same scale.

    g) List any two application of TRIAC.

    h) Draw symbol of NPN and PNP transistor.

    i) Give formula of D.C. output voltage for:

        i) Half wave rectifier.

        ii) Full wave rectifier.

    j) List two types of LED display.

5. **Attempt any FOUR of the following:** **12**

    a) Draw and explain energy band diagram of insulator.

    b) Explain construction of TRIAC.

    c) Draw circuit diagram of single stage CE amplifier. State the role of coupling capacitor and bypass capacitor.

    d) Explain working principle of zener shunt regulator.

    e) Explain working of fullwave bridge type rectifier.

    f) State and prove Demorgan's first theorem.

6. **Attempt any <u>FOUR</u> of the following:** **12**

   a) With neat sketch explain working principle of LED.

   b) Explain V-I characteristics of SCR in forward direction.

   c) Explain need of power amplifiers. State its types.

   d) Compare half wave rectifier and full wave rectifier (center tapped) with respect to following point:

     i) No. of diode used

     ii) PIV of diode

     iii) Ripple factor.

   e) Using boolean algebra prove that:

     $(A + B)\ (A + C)\ =\ A + BC$

   f) Implement OR gate using only NAND gate.

7. **Attempt any <u>FOUR</u> of the following:** **12**

   a) Explain formation of N-type semiconductor.

   b) Explain working of zener diode in reverse bias condition.

   c) Explain operation of an NPN bipolar junction transistor.

   d) Draw and explain block diagram of power supply.

   e) Sketch the diagram of LC and π (pi) filter. Which circuit is better ? Why ?

   f) Draw symbol, truth table and write logic expression for:

     i) EX-OR gate

     ii) NOR gate.

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3 Hours / 100 Marks