GUJARAT TECHNOLOGICAL UNIVERSITY

BE- 1 SEMESTER – OLD PAPER – S22 TO S24 – QUESTION BANK

Subject Name & Code:

Basic Electrical Engineering (3110005)

Unit 1: DC Circuits

Repeated Questions:

1. State and explain Kirchhoff's Current Law (KCL) and/or Voltage Law (KVL). **(03 Marks - W22, W24)**
2. State and explain Thevenin's Theorem with a suitable example. **(04 Marks - S22, W23, W24)**
3. Derive the expression for equivalent resistances for Star-Delta or Delta-Star transformation. **(07 Marks - W22, W23)**

Other Important Questions:

4. **S22:** Calculate the resistance of a given length of wire (numerical). **(03 Marks)**
5. **S24:** Define Branch, Node, and Mesh/Loop. **(03 Marks)**
6. **S24:** Solve a numerical on series-connected lamps across a supply. **(04 Marks)**
7. **S24:** Explain the Superposition theorem with a suitable example. **(07 Marks)**
8. **W23:** Compare resistive series and parallel circuits. **(03 Marks)**
9. **S23:** Determine the number of branches and nodes in a given circuit. **(03 Marks)**
10. **S23:** Can we apply KVL in a loop containing a current source? Justify. **(03 Marks)**
11. **S23:** Explain an ideal Voltage and Current source. **(04 Marks)**
12. **S23:** Use Nodal analysis to find currents in a network. **(07 Marks)**
13. **S22:** Use Thevenin's theorem to find current in a resistance in a Wheatstone bridge. **(07 Marks)**
14. **S22:** Derive the expression for capacitor charging $Vc=V(1-e-t/RC)$. **(07 Marks)**
15. **W24:** Find equivalent resistance, current, voltage drop, and power loss in a series circuit (numerical). **(07 Marks)**
16. **W23:** Use the Superposition theorem to find the current in a branch (numerical). **(07 Marks)**

Unit 2: AC Circuits

Repeated Questions:

1. Define AC waveform terms: Time Period, Frequency, Amplitude, Instantaneous, Average, RMS value, Form Factor, Peak Factor. **(07 Marks - S22, W22, S24, W24)**
2. Prove that power consumed in a purely inductive/capacitive circuit is zero and current lags/leads voltage by 90°. **(07 Marks - S22, W22, W23)**
3. Derive the relationship between line and phase values of current/voltage in a balanced three-phase Delta connection. **(07 Marks - S22, W23, W24)**

Other Important Questions:

4. **S24:** Find impedance, current, and power in an R-L-C series circuit (numerical). **(03 Marks)**
5. **S24:** Draw voltage and current waveforms for R-L and R-C series circuits. **(04 Marks)**
6. **W22:** Describe the phenomenon of series resonance in an R-L-C series circuit. **(07 Marks)**
7. **S23:** Find the average and RMS value for a given waveform. **(04 Marks)**
8. **S23:** Compare series and parallel resonance. **(03 Marks)**
9. **S23:** Distinguish between Apparent, Active, and Reactive power. **(04 Marks)**
10. **S24:** Find the magnitude and phase of the resultant of three currents (numerical). **(04 Marks)**
11. **W24:** Calculate average and RMS values from given Form Factor and Peak Factor (numerical). **(04 Marks)**
12. **S22:** Write the comparison between Series and Parallel resonance. **(03 Marks)**
13. **S22:** Draw Impedance, Voltage, and Power triangles for an R-L series circuit. **(04 Marks)**
14. **S23:** Solve a numerical on a 3-phase unbalanced load. **(07 Marks)**
15. **W23:** Draw the power triangle and define Active, Reactive, and Apparent power. **(03 Marks)**
16. **W24:** Describe the open circuit and short circuit test on a single-phase transformer. **(07 Marks)**
17. **S22:** List the merits of the two-wattmeter method. **(03 Marks)**
18. **S22:** Obtain the relationship for a Star-connected system. **(07 Marks)**
19. **W24:** List the merits of the two-wattmeter method. **(03 Marks)**
20. **W24:** Compare series and parallel RLC circuit resonance. **(04 Marks)**

Unit 3: Transformers

Repeated Questions:

1. Derive the EMF equation of a single-phase transformer. **(04 Marks - W22, W23, W24)**
2. Explain the construction and working principle of a single-phase transformer. **(07 Marks - S22, S23)**
3. Explain the autotransformer with its advantages, disadvantages, and applications. **(07 Marks - S22, S24)**

Other Important Questions:

4. **S22:** Explain the working principle of a single-phase transformer. **(03 Marks)**
5. **W22:** Draw the construction of a single-phase core-type transformer. **(04 Marks)**
6. **S24:** Compare core-type and shell-type transformers. **(04 Marks)**
7. **W23:** Write a short note on autotransformer. **(03 Marks)**
8. **W23:** Compare core-type and shell-type single-phase transformers. **(04 Marks)**
9. **S23:** Explain why the rating of a transformer is in kVA. **(Part of 07 Mark question)**
10. **W23:** Explain various connections of a three-phase transformer with a diagram. **(07 Marks)**
11. **S22:** Write applications of Auto Transformer. **(03 Marks)**
12. **S22:** Draw and explain the BH curve. **(03 Marks)**
13. **S23:** Draw and explain the BH curve briefly. **(03 Marks)**

Unit 4: Electrical Machines

Repeated Questions:

1. Explain the construction of a DC machine. **(07 Marks - S22, W23, W24)**
2. Explain the construction of a synchronous generator/alternator with a diagram. **(07 Marks - S22, S23, S24, W23, W24)**
3. Compare Squirrel Cage and Slip Ring (Wound Rotor) Induction Motors. **(04 Marks - S22, W24)**

Other Important Questions:

4. **S22:** Mention merits and demerits of a Single-Phase Induction Motor. **(03 Marks)**
5. **S22:** Explain the working of a capacitor-start single-phase induction motor. **(04 Marks)**
6. **W22:** Prepare a list of parts of a Single-Phase AC Motor. **(03 Marks)**
7. **W22:** List various parts of a DC Motor and explain each. **(07 Marks)**
8. **S23:** Explain how a rotating magnetic field is produced in a three-phase induction motor. **(07 Marks)**
9. **W23:** Explain the working principle of a synchronous motor. **(03 Marks)**
10. **W23:** Classify and compare various types of DC motors. **(04 Marks)**
11. **S24:** Give the classification of DC Motors. **(03 Marks)**
12. **S24:** List different parts of a DC machine and explain any one part. **(04 Marks)**
13. **W24:** Prepare a list of parts of a Single-phase AC Motor. **(04 Marks)**
14. **W24:** Explain the working of a capacitor-start single-phase induction motor. **(04 Marks)**
15. **S22:** State types of single-phase split-phase induction motors. **(03 Marks)**
16. **S22:** Analyze how to reverse the direction of rotation of a DC shunt motor. **(04 Marks)**
17. **S23:** Explain the principle, construction, and working of a synchronous generator. **(07 Marks)**

Unit 5: Electrical Installations

Repeated Questions:

1. Explain different methods of power factor improvement. **(07 Marks - S22, S24, W23, W24)**
2. Compare MCB and Fuse. **(03 Marks - W22, W23)**
3. Classify different types of earthing and explain any one (Pipe, Plate) in detail. **(07 Marks - S22, W23, W24)**

Other Important Questions:

4. **S22:** Explain the protective device Switch Fuse Unit (SFU). **(03 Marks)**
5. **S22:** Explain types of wires used in residential and commercial wiring. **(04 Marks)**
6. **W22:** Compute monthly energy charges for an appliance (numerical). **(04 Marks)**
7. **W22:** Explain the working of an Earth Leakage Circuit Breaker (ELCB). **(07 Marks)**
8. **W22:** Draw the structure of an underground cable. **(03 Marks)**
9. **W22:** Explain the construction of a 3-phase induction motor. **(04 Marks)**
10. **W22:** Briefly describe pipe earthing. **(07 Marks)**
11. **S23:** List safety measures against electric shocks. **(03 Marks)**
12. **S23:** What is the difference between wire & cable? **(04 Marks)**
13. **S24:** List various safety devices used for domestic purposes. **(03 Marks)**
14. **S24:** Explain the necessity of earthing. **(04 Marks)**
15. **S24:** Calculate an electricity bill (numerical). **(07 Marks)**
16. **S24:** What is an MCCB? Where is it used? **(03 Marks)**
17. **S24:** State the advantages and applications of underground cables. **(04 Marks)**
18. **W23:** Compute energy charges for an air conditioner (numerical). **(03 Marks)**
19. **W23:** Write safety precautions for electrical appliances. **(04 Marks)**
20. **W23:** Write advantages and disadvantages of ELCB. **(03 Marks)**
21. **W24:** Write advantages and disadvantages of ELCB. **(03 Marks)**
22. **W24:** Draw the structure of an underground cable. **(04 Marks)**
23. **W24:** Compute monthly energy charges for an appliance (numerical). **(04 Marks)**
24. **S22:** Define battery capacity and list parts of a lead-acid battery. **(04 Marks)**
25. **S23:** Define the term battery capacity. On which factors does it depend? **(04 Marks)**