GUJARAT TECHNOLOGICAL UNIVERSITY

DI -1 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK(English)

Subject Name & Code:

D.C Circuits- 4310901

Unit I: Fundamental Concepts of DC Circuits

Repeated Questions:

1. **Define/Explain Conductor, Insulator, and Semiconductor.**
    - Appeared in: **SUM22 (Q1a, 03 marks)**, **WIN23 (Q2a, 03 marks)**, **SUM24 (Q3a, 03 marks)**
2. **State and Explain Ohm's Law.**
    - Appeared in: **SUM23 (Q1a, 03 marks)**, **WIN23 (Q1a, 03 marks)**, **SUM25 (Q2c, 07 marks)**
3. **Compare Series and Parallel Circuits.**
    - Appeared in: **SUM22 (Q2b, 04 marks)**, **WIN22 (Q4b, 04 marks)**, **WIN23 (Q2b, 04 marks)**, **SUM24 (Q2c, 07 marks)**, **SUM25 (Q1c, 07 marks OR)**
4. **Define: (1) Network (2) Loop (3) Branch.**
    - Appeared in: **SUM22 (Q3a, 03 marks)**, **SUM23 (Q2a, 03 marks)**, **SUM24 (Q3c, 07 marks)**, **WIN23 (Q2c, 07 marks)**, **SUM25 (Q3c, 07 marks)**
5. **Explain Open Circuit, Short Circuit, and Closed Circuit.**
    - Appeared in: **SUM22 (Q2a, 03 marks)**, **SUM23 (Q2b, 04 marks)**, **WIN23 (Q3a, 03 marks)**, **SUM25 (Q1b, 04 marks)**

Other Important Questions:

- Write effect of Temperature on Resistance. (SUM22 - Q1b, 04 marks)
- Explain Kirchhoff's voltage law with suitable example. (SUM22 - Q1c, 07 marks)
- Prove that $R_2 = R_1[1 + \alpha_0(t_2 - t_1)]$. (SUM22 - Q1c OR, 07 marks); (SUM24 - Q1c OR, 07 marks)
- Define ideal current source and ideal voltage source with its graph. (SUM22 - Q2a OR, 03 marks)
- Discuss connection of resistors in series. (SUM22 - Q2b OR, 04 marks)
- Define: (1) Active element (2) Node (3) Passive element. (SUM23 - Q2a OR, 03 marks)
- Explain principle of Duality. (SUM23 - Q2b OR, 04 marks)

- Three resistors of 10Ω, 20Ω and 30Ω are connected in series 120V supply. Find (i) equivalent resistance (ii) current flowing through the circuit (iii) voltage drop across each resistor (iv) power loss in each resistor. (SUM23 - Q2c OR, 07 marks)
- Difference between EMF and Potential Difference. (SUM24 - Q1a, 03 marks)
- State and Explain Joule's law. (SUM24 - Q1b, 04 marks); (SUM25 - Q2b OR, 04 marks)
- Define work, power & energy. (SUM24 - Q2a, 03 marks); (SUM25 - Q2a OR, 03 marks)
- Three resistors of 10 Ω, 20 Ω and 30 Ω are connected in parallel across 240 V supply. Calculate (1) Equivalent resistance (2) current through each resistor (3) Total current. (SUM24 - Q2b, 04 marks); (SUM25 - Q2b, 04 marks)
- State and explain kirchhoff's current and voltage law. (SUM24 - Q2c, 07 marks); (SUM25 - Q2c OR, 07 marks)
- Explain Factor affecting on resistance. (SUM24 - Q2a OR, 03 marks); (SUM25 - Q1c, 07 marks)
- Resistors of 12Ω and 8 Ω are connected in parallel and a resistance of RΩ is connected in series with it. When a 20V DC supply is given to this combination, 70W power is dissipated. Find value of R. (SUM24 - Q2b OR, 04 marks)
- Why all domestic appliances are connected in parallel? (SUM25 - Q1a, 03 marks)
- A wire has resistance of 4Ω. It has been stretched to the length double that of original. What will be the new resistance of wire? (SUM25 - Q2a, 03 marks)

Unit II: Network Solutions Techniques

Repeated Questions:

1. **Explain Mesh analysis method using suitable example.**
    - Appeared in: **SUM22 (Q2c, 07 marks)**
2. **Explain Nodal analysis method using suitable example.**
    - Appeared in: **SUM22 (Q2c OR, 07 marks)**
3. **Derive equations for converting star connected network into equivalent delta connected network.**
    - Appeared in: **SUM23 (Q3c, 07 marks)**, **SUM25 (Q3c OR, 07 marks)**
4. **Derive equations for converting delta connected network into equivalent star connected network.**
    - Appeared in: **SUM23 (Q3c OR, 07 marks)**, **SUM25 (Q4c, 07 marks)**

Other Important Questions:

- Explain active network & passive network. (SUM22 - Q3a OR, 03 marks)
- Explain Delta-Star Transformation. (SUM22 - Q4b, 04 marks)
- Explain Star-Delta Transformation. (SUM22 - Q4b OR, 04 marks)
- Three resistances of 6 Ω, 15Ω, and 10Ω are connected in star. Find their equivalent delta connected network. (SUM24 - Q3c OR, 07 marks)
- Three resistances of 40 Ω, 60Ω and 80Ω are connected in delta. Find their equivalent star connected network. (SUM24 - Q4c OR, 07 marks)
- Three resistances of 10 Ω, 20 Ω and 30 Ω are connected in delta. Find their equivalent star connected network. (SUM25 - Q3c, 07 marks)
- Three resistances of 20 Ω, 50Ω and 30Ω are connected in star. Find their equivalent delta connected network. (SUM25 - Q4c, 07 marks)

Unit III: Network Theorems

Repeated Questions:

1. **State and explain Superposition theorem.**
    - Appeared in: **WIN22 (Q4a OR, 03 marks)**, **SUM23 (Q3b, 04 marks)**, **SUM24 (Q3a OR, 03 marks)**, **WIN23 (Q4c, 07 marks)**, **SUM25 (Q3a, 03 marks)**
2. **State and explain Thevenin's theorem.**
    - Appeared in: **WIN22 (Q5b, 04 marks)**, **SUM23 (Q3a, 03 marks)**, **WIN23 (Q5b, 04 marks)**, **SUM25 (Q3b OR, 04 marks)**
3. **State and explain Norton's theorem.**
    - Appeared in: **SUM23 (Q3a OR, 03 marks)**, **SUM24 (Q3b, 04 marks)**, **WIN23 (Q4a, 03 marks)**
4. **State and explain Maximum Power Transfer theorem.**
    - Appeared in: **WIN22 (Q4a, 03 marks)**, **SUM23 (Q3b OR, 04 marks)**, **SUM25 (Q4a OR, 03 marks)**

Other Important Questions:

- Explain "maximum power transfer theorem". (WIN22 - Q4a, 03 marks)
- With circuit diagram explain star to delta transformation. (WIN22 - Q5c, 07 marks)
- Derive the condition for maximum transfer of power from source to the load. (WIN22 - Q5b OR, 04 marks); (WIN23 - Q5b OR, 04 marks)
- State and explain Reciprocity theorem. (SUM22 - Q3b OR, 04 marks); (SUM24 - Q4a, 03 marks)
- Explain Reciprocity theorem. (SUM24 - Q4a, 03 marks)
- Find the voltage across branch CD and the current across B1 in the network shown in the figure (1). (WIN23 - Q1c OR, 07 marks)

Unit IV: Capacitors and its Applications

Repeated Questions:

1. **Derive the equation for energy stored in a capacitor.**
    - Appeared in: **WIN22 (Q5a, 03 marks)**, **SUM23 (Q4c, 07 marks)**, **SUM24 (Q4b OR, 04 marks)**, **SUM25 (Q4b OR, 04 marks)**
2. **Derive the equation for charging of capacitor.**
    - Appeared in: **SUM22 (Q4c OR, 07 marks)**, **SUM23 (Q4c OR, 07 marks)**, **WIN23 (Q5c, 07 marks)**
3. **Give classification of capacitor. / State and classify types of capacitors.**
    - Appeared in: **SUM22 (Q4a, 03 marks)**, **WIN23 (Q5a, 03 marks)**

Other Important Questions:

- Derive the value of parallel plate capacitor with composite dielectric material. (WIN22 - Q5a OR, 03 marks); (SUM23 - Q4a, 03 marks)
- Explain capacitor in series circuit. (WIN22 - Q2a OR, 03 marks)
- Derive the equation of total capacitance for capacitors are connected in series. (SUM24 - Q4b, 04 marks)
- Derive the equation of total capacitance for capacitors are connected in parallel. (SUM25 - Q4b OR, 04 marks)
- 1μF, 2μF, 3μF and 6μF Capacitors are connected in parallel and supply is given of 100V DC. Find Equivalent capacitance and charge across each capacitor. (SUM24 - Q4c, 07 marks)
- 10μF, 20μF and 30μF Capacitors are connected in series and supply is given of 200V DC. Find voltage across each capacitor. (SUM25 - Q4c OR, 07 marks)
- Explain the factors affecting the capacitance of capacitor. (SUM23 - Q4b, 04 marks)
- Write notes on disposal of old batteries. (SUM23 - Q4a OR, 03 marks)
- Explain the advantages of recycling the electronic components. (SUM23 - Q4b OR, 04 marks)
- State the difference between primary cell and secondary cell. (SUM24 - Q4a OR, 03 marks); (WIN23 - Q5c OR, 07 marks); (SUM25 - Q4a, 03 marks)

Unit V: Magnetism and Electromagnetism

Repeated Questions:

1. **State and explain Faraday's laws of electromagnetic induction.**
    - Appeared in: **WIN22 (Q3a OR, 03 marks)**, **SUM23 (Q5a OR, 03 marks)**, **SUM24 (Q5a, 03 marks)**, **SUM25 (Q5a OR, 03 marks)**
2. **Compare Magnetic circuit and Electric circuit.**
    - Appeared in: **WIN22 (Q1c OR, 07 marks)**, **SUM23 (Q5a, 03 marks)**, **WIN23 (Q4b, 04 marks)**, **SUM25 (Q5c OR, 07 marks)**
3. **Explain Hysteresis loop.**
    - Appeared in: **WIN22 (Q3c, 07 marks)**, **SUM23 (Q5b, 04 marks)**
4. **Obtain the equation of coupling co-efficient $K=M/\sqrt{L_1L_2}$ between the two coils.**
    - Appeared in: **SUM22 (Q5c, 07 marks)**, **SUM25 (Q5c, 07 marks)**

Other Important Questions:

- State Lenz's law and Ohm's law. (WIN22 - Q1b, 04 marks)
- Write conditions for production of dynamically induced e.m.f. (WIN22 - Q2b, 04 marks)
- Define: (1) Work (2) Power (3) Energy (4) M.M.F. (WIN22 - Q3b, 04 marks)
- Give the classification of inductor. (WIN22 - Q2b OR, 04 marks)
- Explain conversion of current source to voltage source and vice versa with necessary diagram and example. (WIN22 - Q2c OR, 07 marks)
- Define Node, Junction, Loop and Mesh. (WIN22 - Q3b OR, 04 marks)
- Describe Kirchoff's current law And voltage law. (WIN22 - Q3c OR, 07 marks)
- Define: Magneto motive force and Magnetic Flux. (WIN22 - Q5b OR, 04 marks); (SUM25 - Q5a, 03 marks)
- Define Reluctance, Permeability and Magnetic Field Intensity. (SUM25 - Q5b, 04 marks)
- Explain co-efficient of self-induction and state equation regarding it. (SUM23 - Q5c, 07 marks)
- Explain Fleming's left hand rule. (SUM23 - Q5b OR, 04 marks)
- Explain co-efficient of coupling between two coils and explain tight coupling and loose coupling. (SUM23 - Q5c OR, 07 marks)
- Obtain the equation of equivalent inductance L = L1+L2+2M when two inductors are connected in same direction. (SUM24 - Q5b, 04 marks)
- Obtain the equation of equivalent inductance L = L1+L2-2M when two inductors are connected in series opposition. (SUM25 - Q5b OR, 04 marks)
- Difference between Statically and dynamically induced emf. (SUM24 - Q5a OR, 03 marks); (WIN23 - Q4b OR, 04 marks)
- Define Magneto motive force and Magnetic Flux. (SUM24 - Q5b, 04 marks)
- Write short note on magnetic hysteresis. (WIN23 - Q1b, 04 marks)
- Classification of inductor and types of inductor. (WIN23 - Q3c, 07 marks)
- Derive equation for co-efficient of coupling K = M/√L1 + L2. (WIN23 - Q3c OR, 07 marks)
- Define. (a) MMF (b) Magnetic field strength (c) Permeability. (WIN23 - Q5a OR, 03 marks)

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