

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER- I & II (NEW) EXAMINATION – WINTER 2019****Subject Code: 3110005****Date: 11/01/2020****Subject Name: Basic Electrical Engineering****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

|     |                                                                                                                                                                                                                                                                          | Marks |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Q.1 | (a) State Ohm's law and Kirchhoff's Laws in context with DC circuits.                                                                                                                                                                                                    | 03    |
|     | (b) A 100V, 60 Watt bulb is to be operated from a 220V supply. What is the resistance to be connected in series with the bulb to glow normally?                                                                                                                          | 04    |
|     | (c) Derive an expression for equivalent resistances of a star connected network to transform into a Delta connected network.                                                                                                                                             | 07    |
| Q.2 | (a) State Thevenin's and Norton's Theorems.                                                                                                                                                                                                                              | 03    |
|     | (b) Compare series and parallel resonance in ac circuit.                                                                                                                                                                                                                 | 04    |
|     | (c) A single phase R-L-C circuit having resistance of $8\Omega$ , inductance of 80mH and capacitance of $100\mu\text{F}$ is connected across single phase ac 150 V, 50Hz supply. Calculate the current, power factor and voltage drop across inductance and capacitance. | 07    |
|     | <b>OR</b>                                                                                                                                                                                                                                                                |       |
|     | (c) Derive an expression for the voltage across the capacitor during charging through the resistor at any instant $V_C = V(1 - e^{-t/RC})$ . Assume that RC series circuit is connected across a DC supply of voltage V.                                                 | 07    |
| Q.3 | (a) Define the following terms in connection with AC waveforms:-<br>1. Q-Factor      2. Power Factor<br>3. Form factor.                                                                                                                                                  | 03    |
|     | (b) Draw impedance triangle, Voltage triangle, Power triangle for single phase R-L series circuit.                                                                                                                                                                       | 04    |
|     | (c) Derive the relationship between Phase and Line values of voltages and currents in case of 3-phase Star- connection.                                                                                                                                                  | 07    |
|     | <b>OR</b>                                                                                                                                                                                                                                                                |       |
| Q.3 | (a) Define the terms:- 1. Real power 2. Reactive power 3. Apparent power.                                                                                                                                                                                                | 03    |
|     | (b) Derive the EMF equation of single phase transformer.                                                                                                                                                                                                                 | 04    |
|     | (c) With neat circuit diagram and a phasor diagram prove that two watt meters are sufficient to measure total power in 3-phase system.                                                                                                                                   | 07    |
| Q.4 | (a) Explain working principle of single phase Transformer.                                                                                                                                                                                                               | 03    |
|     | (b) Give Merits, Demerits and Applications of Induction Motor.                                                                                                                                                                                                           | 04    |
|     | (c) Explain in detail the construction of an Alternator.                                                                                                                                                                                                                 | 07    |
|     | <b>OR</b>                                                                                                                                                                                                                                                                |       |
| Q.4 | (a) Explain working principle of D.C. Motor.                                                                                                                                                                                                                             | 03    |
|     | (b) Compare poly phase Induction Motor and single phase Induction Motor.                                                                                                                                                                                                 | 04    |

- (c) Explain Generation of Rotating Magnetic Field in 3-phase Induction Motor with diagrams and equations. **07**  
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- Q.5** (a) Classify different types of cables with reference to voltage and insulation materials. **03**
- (b) Explain the terms:- 1. Residual magnetism 2. Coercive Force. **04**
- (c) Explain the process of charging and discharging of Lead acid cell. **07**
- OR**
- Q.5** (a) Compare MCB and ELCB. **03**
- (b) Write safety precautions for electrical Applications. **04**
- (c) Explain different methods of power factor improvement. **07**

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