Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE – SEMESTER 1&2 EXAMINATION – SUMMER 2020

Subject Code: 3110005 Date:10/11/2020

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)**	A resistance of 10Ω is connected in series with two resistances each of the 15Ω arranged in parallel. What resistance must be shunted across this parallel combination so that total current taken shall be 1.5 A with 20 V applied?	**03**
	(b)	State the superposition theorem with suitable example.	**04**
	(c)	For the Wheatstone bridge diagram shown in **Figure 1**, obtain the current flowing through the 20Ω resistance using Thevenin's equivalent network.	**07**
Q.2	**(a)**	Explain Kirchoff's law for DC series network in brief.	**03**
	(b)	Define the following terms for AC (alternating current) signal: (i) Crest Factor (ii) Form Fator (iii) Average Value (iv) RMS Value.	**04**
	(c)	A current of 5 A flows through a non-inductive resistance in series with a choking coil when supplied at 250V,50Hz. If the voltage across the resistance is 125 V and across the coil 200V, calculate (i) impedance, reactance and resistance of the coil (ii) the power absorbed by the coil (iii) and total power.	**07**
		OR	
	(c)	Prove that the current in purely inductive circuit lags its voltage by 90° and average power consumption in pure inductor is zero.	**07**
Q.3	**(a)**	Write the comparison between series resonance and parallel resonance condition in AC circuit.	**03**
	(b)	Derive the relation between line-voltage and phase-voltage for three-phase four wire star connection network. Also, prove that the total three-phase power consumption in star connection is $P_T = \sqrt{3}\, V_L\, I_L \cos\varphi$.	**04**
	(c)	Explain various connections of three phase transformer with diagram.	**07**
		OR	
Q.3	**(a)**	Explain magnetic hysteresis.	**03**
	(b)	Derive the E.M.F. equation of a single phase transformer	**04**
	(c)	State the difference in core type and shell type transformer with neat and clean construction diagram.	**07**
Q.4	**(a)**	How the rotating magnetic field is produce in three-phase induction motor? Explain in brief.	**03**
	(b)	Why single-phase induction motor is not self starting while three-phase induction motor is self starting. Explain in brief.	**04**
	(c)	Explain construction of Alternator with neat diagram.	**07**
		OR	

Q.4	**(a)**	Justify that how back e.m.f. in DC motor acts like a governor.	**03**
	(b)	State the comparison of generator and motor action with respect to design and working principle. Draw the necessary diagram.	**04**
	(c)	Write working principle of DC motor with neat diagram.	**07**
Q.5	**(a)**	Calculate the resistance of a 100 m length of wire having a uniform cross sectional area of 0.02 mm^2 and having resistivity of 40 μΩ-cm.	**03**
	(b)	Discuss types of cables used for residential and commercial wiring.	**04**
	(c)	Explain the following protective devices in detail: (i) SFU (ii) MCB (iii) ELCB	**07**

OR

Q.5	**(a)**	A d-c generator has an e.m.f of 200 volts and provides a current of 10 amps. How much energy does it provide each minute?	**03**
	(b)	Explain the construction of the lead-acid battery with neat diagram.	**04**
	(c)	Explain different types earthing and its importance in electrical utility system in detail.	**07**

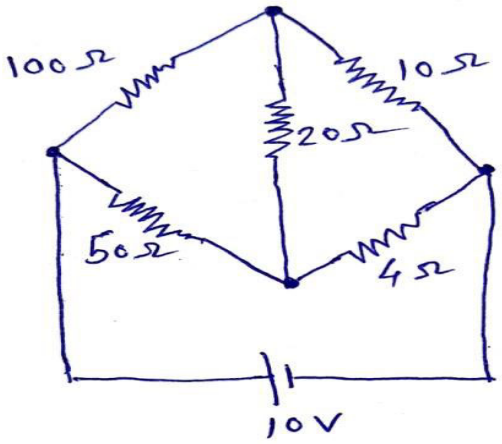

Figure - 1