Ref. No.: EX/CE/ET/T/116/2017(S)

B. CIVIL ENGG. 1ST YEAR 1ST SEM. SUPPLEMENTARY EXAMINATION-2017

Subject: BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: Three Hours **Full Marks: 100**

Use a separate Answer-Script for each Part

Part I: (50 marks)

Answer any ***Five*** questions taking ***at least Two*** from each Section

Section A

Q1 (a) State Norton and Thevenin's theorem. 4

(b) For the circuit, shown in Fig P-1(b), find the Thevenin and Norton equivalent circuits. 6

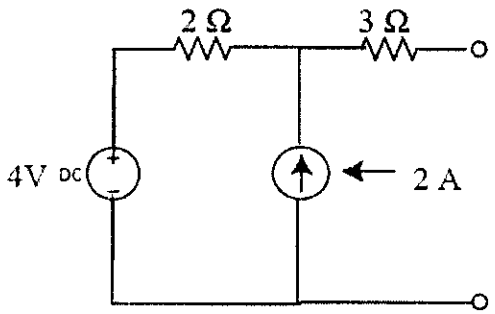

Fig. P-1(b)

Q2 (a) Define and find the expression for Reluctance of a magnetic circuit. 1+3

(b) Consider a toroid with the mean length of 20 cm, the cross section of 2 cm^2, and the relative magnetic permeability of 6700. What will be the magnetic flux and the magnetic flux density if the coil has 10 turns and the current is 2 amperes? 6

Q3 (a) Explain how voltage builds up in a d.c. shunt generator. 4

(b) An 8-pole d.c. generator has 960 conductors and a flux/pole of 20 mwb. Calculate the emf generated when running at 500 rpm for (i) lap, and, (ii) wave connected armature winding. 6

Q4 (a) What is synchronization? Discuss the conditions that must be satisfied to achieve synchronization? 2+4

(b) A three-phase synchronous generator has a per phase synchronous reactance of 10 Ω and delivers a load consisting of a 15 Ω pure capacitive reactance. Determine the ratio of induced emf and terminal voltage. 4

Q5 Write short notes on: 5+5

(a) Hysteresis Loss;

(b) Maximum Power Transfer Theorem.

Section B

Q6	(a)	Define the r.m.s. and average values of an alternating sinusoidal current waveform.	4
	(b)	A resistance of 7 Ω is connected in series with a pure inductance of 31.8 mH and the circuit is connected to a 100 V, 50 Hz, sinusoidal supply. Calculate: (i) the circuit current; (ii) the phase angle.	6
Q7	(a)	Show that two wattmeters are sufficient for measuring the active power of a balanced three-phase system.	4
	(b)	The input power to a three-phase motor was measured by the two wattmeter method. The readings were 5.2 kW and −1.7 kW, and the line voltage was 400 V. Calculate: (i) the total active power; (ii) the power factor; (iii) the line current.	6
Q8	(a)	Explain the principle of generating rotating magnetic field in three-phase induction motors.	6
	(b)	The frequency of the emf induced in the stator winding of an 8-pole induction motor is 50 Hz and that in the rotor is 1.5 Hz. Determine the (i) speed, and, (ii) slip of the motor.	4
Q9	(a)	Write down the assumptions of an ideal transformer.	4
	(b)	A 250 kVA, 11000 V/400 V, 50 Hz single-phase transformer has 80 turns on the secondary. Calculate: (i) the approximate values of the primary and secondary currents; (ii) the approximate number of primary turns; (iii) the maximum value of the flux.	6
Q10		Write short notes on: (a) Starting of Squirrel-Cage Induction Motors; (b) Open Circuit test on Transformers.	5+5

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BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Time: 3Hrs **Full Marks: 50**

Part II

Use Separate Answer scripts for each Group
Answer any five (05) of the following questions.

1) Answer any five (*any 02*) briefly. **[05x2=10]**
   i) What is a semiconductor? Explain different types.
   ii) What is Atomic Energy Level and define the unit of energy in joules and electron-volts.
   iii) What are charged particles? Define work-function of a metal.

2) What is a diode? Draw a neat sketch of its symbol, structure and characteristics for the different types. **[10]**

3) Describe the Energy Band in crystals with appropriate figures and equations. Explain Fermi-Dirac Distribution Function with appropriate figures and equations. **[05+05=10]**

4) Add 17 and 19 after converting them to binary value. Express the same in hexa-decimal and octal notations. **[10]**

5) Draw the schematic diagram and show the k-map operation table for a) AND gate b) OR gate c) NAND gate d) NOR gate. **[10]**

6) As system of particles obeys Fermi-Dirac distribution function. Show that the probability of vacancy of an energy level ΔE above the Fermi level E_F is the same as the probability of occupancy of an energy level ΔE below E_F. **[10]**

7) Why the field - effect transistor is called unipolar? Draw schematically the structure of an n-channel JFET and explain the terms source, drain, gate and channel. What is the significance of the term field-effect? Draw the circuit symbol of the JFET. **[10]**

8) A diode has a forward resistance of which is 50Ω, supplies power to a load resistance 1200Ω for a 20V (rms) source. Calculate,
   a) The DC load current.
   b) The AC load current.
   c) The % regulation. **[10]**