Department of Leather Engineering

Khulna University of Engineering & Technology

B. Sc. Engineering 1st Year 1st Term Examination-2021

Basic Electrical Engineering

EEE 1119

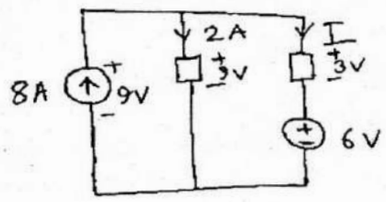
Time: 3.0 Hours | Full Marks: 210

N.B. i) Answer any three questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

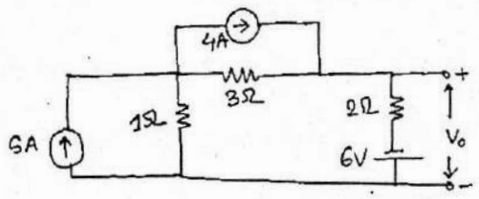
SECTION–A

1(a) Write short notes on the following: **(i)** KVL **(ii)** KCL and **(iii)** Ohm's Law and **(iv)** Circuit parameters 12

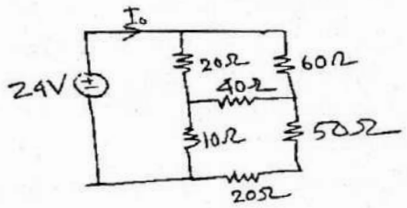
1(b) Find I and the power absorbed by each element in the circuit of the following figure. 10



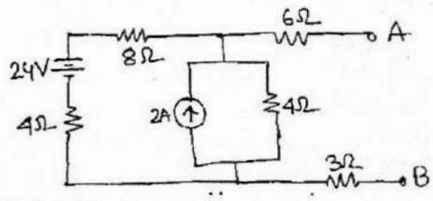
1(c) State the conditions for applying superposition theorem to a circuit. Using super position theorem, find the value of the output voltage V_0 in the circuit of the following figure. 13



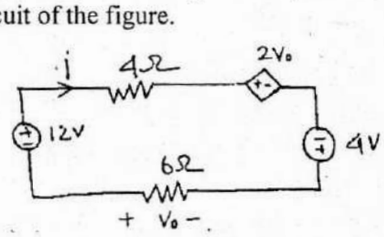
2(a) Deduce the equations for Delta to wye (Δ-Y) conversion. Calculate the current I_0 in the circuit of the figure. 14



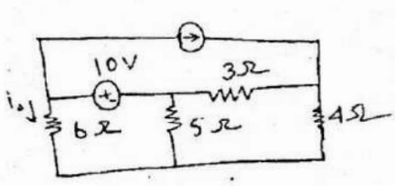
2(b) State Thevenin's theorem. By using this theorem, replace the network shown in figure with reference to terminals A and B. 12



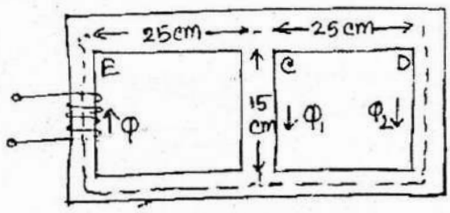
2(c) Determine V_0 and I in the circuit of the figure. 09



3(a) Explain nodal analysis. Apply nodal analysis to find i_0 and the power dissipated in each resistor in the circuit of the figure. 14



3(b) What do you mean by 1 Tesla? A cast steal magnetic structure made for a section 8 cm × 2 cm is shown in the figure. Determine the current that the 500 turn-magnetizing coils on the left limb should carry so that a flux of 2mwb is produced in the right limb. Take $\mu_r = 600$ and neglect leakage. 14



3(c) Transform these sinusoids to phasors; and estimate the sinusoid of power (p). 07
i=6cos(50t-40°); v = - 4sin(30t+50°)

4(a) Define impedance. Derive the equation for impedance and power for R-L and R-C branch. Show graphical representation of voltage, current and power variation in these brances. 15

4(b) Find all possible roots of $\sqrt[3]{\frac{10\angle 45^{o} 5e^{j60^{\circ}}(-4.047-j2.94)}{1-j1.732}}$ 10

4(c) What is the phase relationship between the sinusoidal waves of each of the following: 10
(i) v = -10sin(wt+30); i=5sin(wt+10) **(ii)** i = 2cos(wt+60); v = -3sin(wt-150)

SECTION–B

5(a) Explain the basic components of a DC machine. Also, describe the function of brush and Commutator. 13

5(b) Classify and draw different types of DC generator according to their field and armature coil arrangement. 15

5(c) Explain back e.m.f with the significance. 07

6(a) Describe the Mechanisms of dc motor. Speed control with corresponding circuit and equation. 10

6(b) Describe the operating principle of a 3φ induction motor. The power input to the rotor of a 400V, 50Hz, 6-pole, 3-phase induction motor is 20KW. The slip is 3%. Calculate: 15
(i) The frequency of the rotor current **(ii)** rotor speed **(iii)** rotor copper loss and **(iv)** rotor resistance per phase if rotor current is 80A.

6(c) What is a slip? Draw the **(i)** equivalent circuit and **(ii)** Toque-speed characteristics of an induction motor. 10

7(a) What are the losses in a transformer? Define efficiency and find the condition for maximum efficiency of a transformer. 10

7(b) Describe the voltage transformation ratio for step-down and step-up transformers. The maximum flux density in the core of a 250/3000-volts, 50-Hz single-phase transformer is 1.2 wb/m^2. If the emf per turn is 8V determine: **(i)** Primary and secondary turns **(ii)** Area of the core 15

7(c) Draw the circuit for open-circuit test and short circuit test of a transformer. What are the functions of these test? 10

8(a) Explain the basic principle of 3φ synchronous generator. Also write five basic differences between synchronous generator and DC generator. 10

8(b) What are the basic differences between synchronous motor and induction motor? 05

8(c) Why synchronous motor is not self-starting? 10

8(d) Explain working Principle and applications of servo-motor. 10