Printed page: 03 **Subject Code: AMIEC0101**

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

BACHELOR OF TECHNOLOGY (B.Tech).

(SEM: FIRST SEMESTER, THEORY EXAMINATION (2020-2021)

SUBJECT NAME: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Time: 3 Hours **Max. Marks:100**

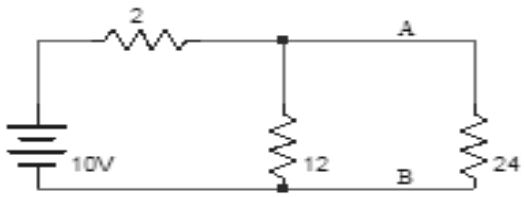
General Instructions:

- All questions are compulsory. Answers should be brief and to the point.
- This Question paper consists of 03 pages & 8 questions.
- It comprises of three Sections, A, B, and C. You are to attempt all the sections.
- **Section A** -Question No- 1 is objective type questions carrying 1 mark each, Question No- 2 is very short answer type carrying 2 mark each. You are expected to answer them as directed.
- **Section B** - Question No-3 is Long answer type–I questions with external choice carrying 6 marks each. You need to attempt any five out of seven questions given.
- **Section C** - Question No.4 to 8 are Long answer type –II (within unit choice) questions carrying 10 marks each. You need to attempt any one part *a* or *b*.
- Students are instructed to cross the blank sheets before handing over the answer sheet to the invigilator.
- No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.

SECTION – A

1. Answer all the parts- **[10×1=10]** **CO**

a. Consider the circuit shown below. Find the equivalent Thevenin's voltage (volts) between nodes A and B **(1)** **CO1**



(A) 8 (B) 8.5 (C) 9 (D) 9.5

b. In a delta network each element has value R. The value of each element in equivalent star network will be: **(1)** **CO1**

(A) 3R (B) R/3 (C) R/6 (D) R/12

c. In a series R, L circuit, voltage across resistor and inductor are 3 V and 4 V respectively, then what is the applied voltage? **(1)** **CO2**

(A) 7V (B) 1V (C) 5V (D) 25V

d. In RLC series circuit, if the voltage across capacitor is greater than voltage across inductor, then power factor of the network is: **(1)** **CO2**

(A) Lagging (B) Leading (C) Unity (D) Zero

e. Normally the efficiency of a transformer lies in the range of…….. **(1)** **CO3**

f. MCB & ELCB stands for……..&……respectively. **(1)** **CO3**

g. A Zener diode is used as…… **(1)** **CO4**

(A) an amplifier (B) a rectifier (C) a voltage regulator (D) a multivibrator

h. If PIV rating of a diode is exceeded, the diode…….. **(1)** **CO4**

(A) stops conduction (B) is destroyed

(C) conducts heavily in forward direction (D) None of these

i. An ideal Op-Amp has……. **(1)** **CO5**

(A) Infinite input resistance (B) Infinite voltage gain

(C) Zero output resistance (D) All of these

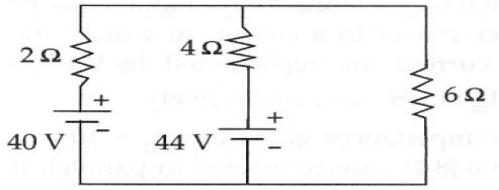
j. Internet domain name and hostname are translated into IP address by…….. **(1)** **CO5**

(A) Domain name system (B) Domain name database

(C) Router (D) Domain information System

2. Answer <u>all</u> the parts- **[5×2=10]** **CO**

a. Calculate the current in 6 Ω branch for the circuit shown in Figure given below- **(2)** **CO1**



b. An RLC circuit consisting of resistance 40 Ω, capacitance 120μF and inductance 5H are connected in series with a supply of 250V, 50Hz source. Calculate quality factor **(2)** **CO2**

c. Explain the principle of operation of a 1-phase Transformer on no-load. **(2)** **CO3**

d. Explain the breakdown mechanism in a diode. **(2)** **CO4**

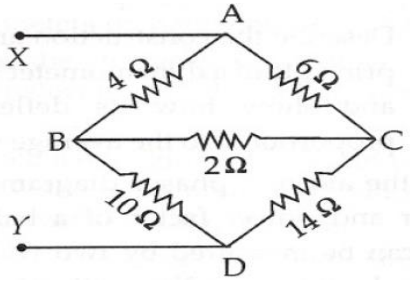
e. Draw the diagrams of Inverting and Non-inverting Op-Amps. **(2)** **CO5**

<u>SECTION – B</u> **CO**

3. Answer any <u>five</u> of the following- **[5×6=30]**

a. Find the equivalent resistance between x-y using star-delta transformation in the Fig.2 shown. **(6)** **CO1**

Fig.2



b. State Maximum Power Transfer Theorem applied for DC circuits. Derive its condition also. **(6)** **CO1**

c. The voltage applied to a circuit is v = 100 sin $(\theta+30^0)$ and the current flowing in the circuit is I = 15 sin $(\theta+60^0)$. Determine the impedance, resistance, reactance, power and the power factor of the circuit. **(6)** **CO2**

d. What are the necessities and advantages of using 3-phase system? Derive $V_L=\sqrt{3}V_{ph}$ for star connection. **(6)** **CO2**

e. A 50KVA transformer is operating at 0.9 power factor lagging and 75% of the full load. Find the efficiency of the transformer if the core and copper losses at full load are 900W and 1200W respectively. **(6)** **CO3**

f. Describe a half wave rectifier using a junction diode. Derive the expressions for ripple factor and efficiency for half wave rectifier circuit. **(6)** **CO4**

g. Draw the circuit diagram of an Integrator using Op-Amp and find the expression of output voltage. **(6)** **CO5**

SECTION – C

4 **Answer any one of the following-** **[5×10=50]** **CO**

a. Find the Thevenin equivalent model across a-b in Fig.3. **(10)** **CO1**

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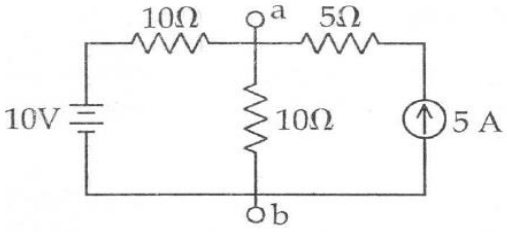

b. Find the node voltages at node X and Y in the circuit of Fig.4. using Nodal Analysis. **(10)** **CO1**

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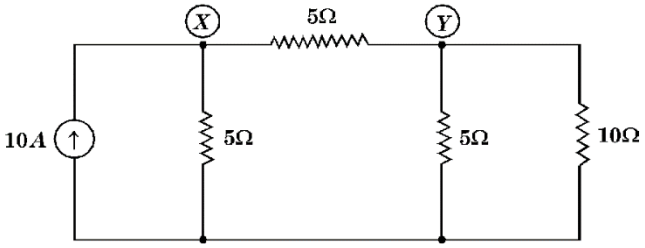

5. **Answer any one of the following-**

a. A series RLC circuit consisting of resistance 20 Ω, capacitance 150μF and inductance 2H are connected with 250V, 50Hz source. Calculate: **(10)** **CO2**

(i) Power factor

(ii) The frequency of supply to be adjusted to make the power factor unity.

(iii) Net reactance and impedance.

b. Derive the expression for power in a three-phase star connection. A balanced star connected load of (8+j6) Ω per phase is connected to a balanced 3-phase, 400V supply. Find the line current, power factor and power. **(10)** **CO2**

6. **Answer any one of the following-**

a. Develop the equivalent circuit of a single-phase transformer on no-load and on-load conditions. **(10)** **CO3**

b. Draw a one-line diagram of a Power System from generating station to end user. Mention the different voltage levels. **(10)** **CO3**

7. **Answer any one of the following-**

a. State and explain the characteristics of a Zener diode. How it can be used as a voltage regulator? **(10)** **CO4**

b. Clearly explain the difference in principle of operation between LED and LCD. Why are LCDs preferred for displays in the pocket calculators? **(10)** **CO4**

8. **Answer any one of the following-**

a. In a Non-inverting Op-Amp, the value of gain is 1.5. If the input resistance is 4kΩ, what should be the feedback resistance R_f to have desired gain? **(10)** **CO5**

b. Find the gain of the amplifier shown in Fig.5. Open loop gain is 10^5. **(10)** **CO5**