Set-B

Roll No. : .....

# MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

290

8/12/22

**First Sessional Examination: Odd Semester 2022-23**

**Course/Branch** : B Tech /ALL/ SET-B/ OP4,OP6,OP8,OP10,OP12 **Semester: I**

**Subject Name** : Fundamental of Electrical Engineering **Max. Marks** : 60

**Subject Code** : BEE101 **Time** : 120 min

*CO-1* : Applying Kirchhoff 's laws and network theorems in solving D.C Circuits.

*CO-2* : Understand the steady state behavior of single phase and three phase A.C circuits.

**Section – A (CO - 1 ) # Attempt both the questions # 30 Marks**

Q.1 : Attempt any SIX questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) Define Unilateral and Bilateral elements (BKL : K2 Level).

b) Define Linear and Non linear elements. (BKL : K2 Level).

c) Define ideal and practical voltage source with its V-I characteristics? (BKL : K2 Level).

d) Define Active and Passive elements. (BKL : K2 Level).

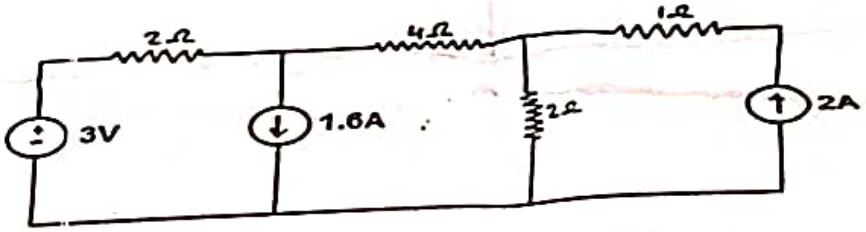
e) State KVL and KCL. (BKL : K2 Level).

f) Define ideal and practical Current source with its V-I characteristics. (BKL : K2 Level).

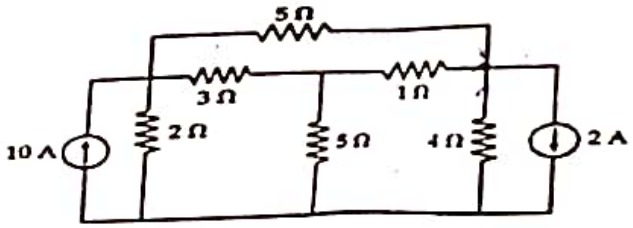
g) Write the application of KVL & KCL. (BKL : K1-K2 Level).

Q.2 : Attempt any THREE questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

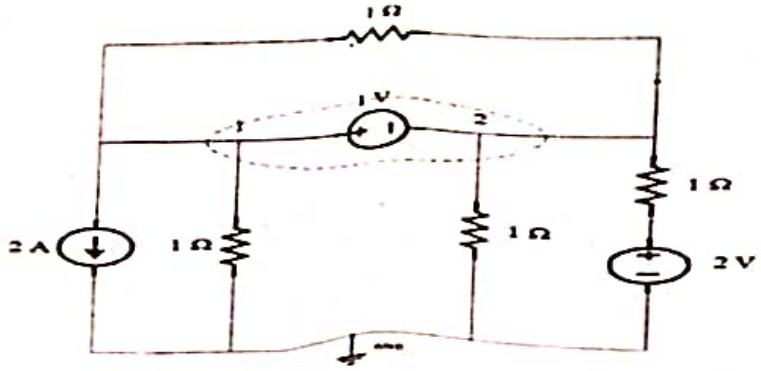
a) Find the current in 2Ω resistance by using mesh analysis. (BKL >= K3 Level).



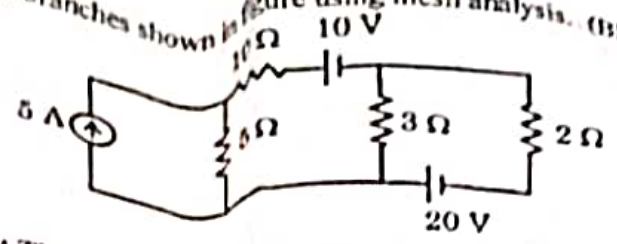

b) Using nodal analysis find the current in all branches. (BKL >= K3 Level).



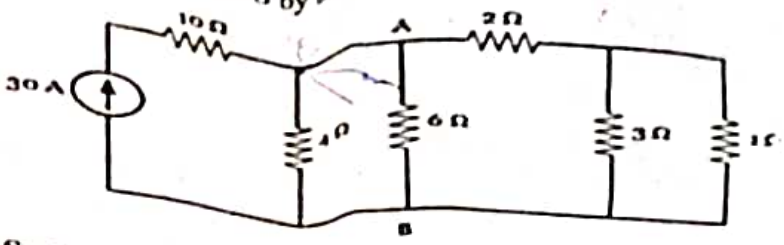

a) Find the current in 1Ω resistance.(BKL >= K3 Level).



d) Find the current in all branches shown in figure using mesh analysis. (BKL >= K3 Level).




e) Determine the current Through A-B by using Nodal analysis



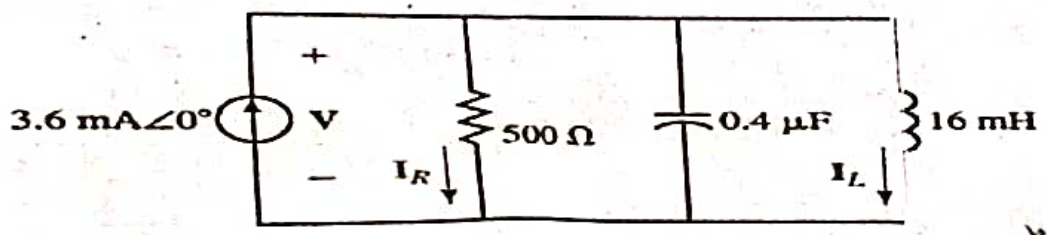

## Section – B (CO - 2) # Attempt both the questions # 30 Marks

Q.3 : Attempt any SIX questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) Define Form factor & Crest factor in A.C circuit. (BKL : K1-K2 Level).
b) What are the advantages of three phase system over single phase system.. (BKL : K1-K2 Level).
c) What is power factor? (BKL : K1-K2 Level).
d) Find the relation between r.m.s and peak value of sinusoidal waveform.. (BKL : K1-K2 Level).
e) R=10 Ω, L= 0.05H and C = 10 μf are connected in parallel. Calculate Quality factor of the ckt.?(BKL : K1-K2 Level).
f) What is the accepter circuit ? (BKL : K1-K2 Level).
g) What is the relation between quality factor and band width?. (BKL : K1-K2 Level).

Q.4 : Attempt any THREE questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

a) Derive the relation between line current & phase current in case of three phase delta connected balanced load. Three identical coils of resistance 8 Ω and inductive reactance 6 Ω are connected in star across 400V mains. Determine power, power factor and line current.. (BKL >= K3 Level).
b) Find the r.m.s, average, form factor and peak factor of the half wave rectifier output.( (BKL >= K3 Level).
c) In a series circuit voltage and current equations are given as.(BKL >= K3 Level).
V = 283 Sin 314t and I = 4 Sin (314t - 45°) Find:
(i)Impedance (ii) Circuit parameters (iii) power factor and Active power.
d) When a inductive coil is connected to 220 V D.C supply, the current in coil is 4 A. Now the same coil is connected to 220 V,50 Hz A.C supply, the current in coil is 13 A. Calculate:
(i) Resistance of the coil (ii) Inductance of the coil.(iii) impedance of the coil. (BKL >= K3 Level).
e) Consider the circuit shown in figure below and calculate the following. (BKL >= K3 Level).




(i) Determine the resonant frequencies, ω(rad/s) and f(Hz) of the tank circuit.
(ii) Find the Q of the circuit at resonance.
(iii) Calculate the voltage across the circuit at resonance.

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# MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Roll No. : .....

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

**Sessional Exanmination / Class Test - II : Odd Semester 2022-23**

18/11

230

**Course/Branch** : B Tech – OP4, OP6, OP8, OP10, OP12
**Subject Name** : Fundamental of Electrical Engineering
**Subject Code** : BEE101
**Semester: First**
**Max. Marks** : 60
**Time** : 120 min

*CO-3* : Identify the application areas of a single phase two winding transformer as well as an auto transformer and calculate their efficiency.

*CO-5* : Describe the components of low voltage electrical installations and perform elementary calculations for energy consumption.

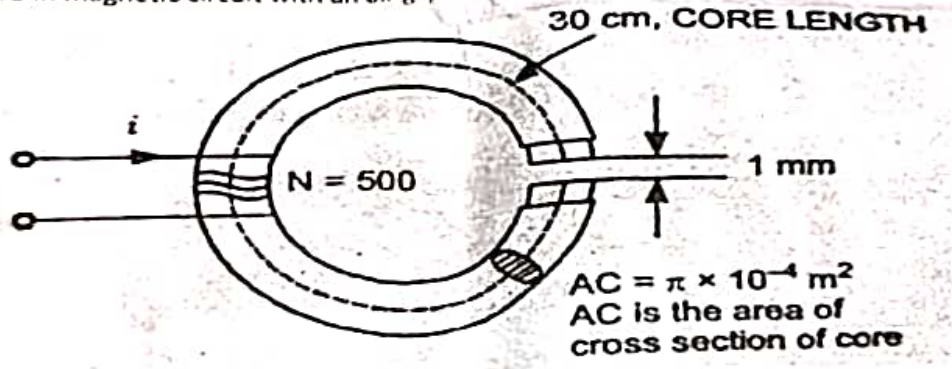
## Section – A (CO - 3 ) # Attempt both the questions # 30 Marks

Q.1 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) Find the relationship between MMF, flux and reluctance.
b) What will happen if primary of transformer is connected to dc supply?
c) Draw the phasor diagram for an ideal transformer and practical transformer on no load.
d) Compare between electric circuits and magnetic circuits.
e) How many types of transformers as construction wise?
f) Define hysteresis & eddy current loss in the transformer.
g) What type of load transformer provides negative voltage regulation?

Q.2 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

a) A wrought iron bar 30 cm long and 2 cm in diameter is bent into a circular shape as given in figure below. It is then wound with 500 turns of wire. Calculate the current required to produce a flux of 0.5 mWb in magnetic circuit with an air gap of 1 mm. $\mu_R$ of iron = 4,000




b) Discuss the principle of operation of a single phase transformer. Derive EMF equation for a single phase transformer.

c) What is the purpose of an equivalent circuit of a transformer? Obtain the approximate equivalent circuit of a transformer as referred to the primary with all necessary parameters.

d) A 40 KVA transformer has a core loss of 400 watts and full load cu loss of 800 watts.If the power factor of the load is 0.9 lagging, Calculate :-
   i) The full load efficiency
   ii) Percentage of the full load at which max.efficiency occurs.
   iii) Maximum efficiency at 0.9 p.f.lagging
   iv) Efficiency at half load unity power factor

e) What is the voltage regulation of a transformer and also obtain the expression of voltage regulation at lagging power factor load.

## Section – B (CO - 5) # Attempt both the questions # 30 Marks

Q.3 : Attempt any **SIX** questions (Short Answer Type). Each question is of two marks. (2 x 6 = 12 Marks)

a) What is ACB explain?
b) Why the earth pin is bigger and thicker?
c) What is Bus-Bar?.
d) Why we need earthing of electrical appliances?
e) Calculate the backup of a battery of 100 AH connected to load of 100 watts, and the supply voltage is 12V.
f) How many types of batteries?
g) What are the Fundamentals of lightning protection.

Q.4 : Attempt any **THREE** questions (Medium Answer Type). Each question is of 6 marks. (3 x 6 = 18 Marks)

a) Write short notes on the following: (i) MCB (ii) MCCB (iii) SFU
b) Write short notes on the following:(i) Types of wires (ii) Types of Cables
c) Explain working of ELCB with neat and clean diagram.
d) A battery is charged at a potential of 15 V in 9 hr when the current flowing is 10 A. The battery on discharge supplies a current of 5 A for 15 hr. The mean terminal voltage during discharge is 14 V. Calculate : Watt-hour efficiency & amp-hour efficiency of battery.
e) Define all characteristics of the batteries.

Roll No. : .....

# MEERUT INSTITUTE OF ENGINEERING AND TECHNOLOGY

NH-58, Delhi-Roorkee Highway, Baghpat Road, Meerut – 250 005 U.P.

**Pre University Test (PUT) : Odd Semester 2022-23**

**Course/Branch** : B.Tech -
**Semester** : I
**Subject Name** : Fundamental of Electrical Engineering
**Max. Marks** : 100
**Subject Code** : BEE101
**Time** : 180 min

*CO-1* : Applying kirchhoff's laws and network theorems in solving D.C Circuits.
*CO-2* : Understand the steady state behavior of single phase and three phase A.C circuits.
*CO-3* : Distinguish between single phase and three phase transformers
*CO-4* : Elaborate the working principle of D.C and A.C electrical machines with their application
*CO-5* : Explain the working of low voltage electrical installation equipments

## Section – A # 20 Marks (Short Answer Type Questions)

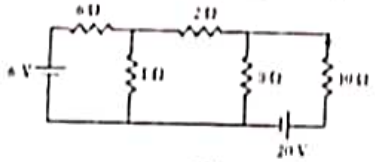
Attempt **ALL** the questions. Each Question is of 2 marks (10 x 2 = 20 marks)

| Q. No | | COs | Attempt **ALL** the questions. Each Question is of 2 marks |
|---|---|---|---|
| 1 | A | CO1 | Define ideal and practical voltage source with its V-I characteristics? |
| | B | CO1 | Define Linear and Non linear elements |
| | C | CO2 | What is dynamic impedance |
| | D | CO2 | R=20 Ω, L = 0.05H and C = 10 μf are connected in parallel. Calculate Quality factor of the circuit ? |
| | E | CO3 | Define MMF, Flux and Reluctance. |
| | F | CO3 | What will happen if primary of transformer is connected to dc supply? |
| | G | CO4 | What is back e.m.f and it's significance in dc motor? |
| | H | CO4 | What is slip? Why Nr < Ns in three phase induction motor. |
| | I | CO5 | Define the Bus-Bar. |
| | J | CO5 | Why earth pin is thicker and bigger? |

## Section – B # 30 Marks (Long / Medium Answer Type Questions)

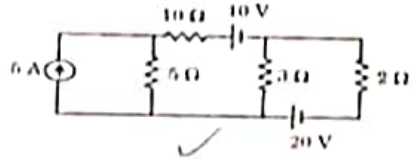
Attempt **ALL** the questions. Each Question is of 6 marks (5 x 6 = 30 marks)

Q.2 (CO-1) : Find the current in all branches shown in figure using mesh analysis.




OR

Find the current in all branches shown in figure using mesh analysis.




Q.3 (CO-2) : Derive the resonant frequency in parallel R.L.C. circuit. Why parallel R.L.C. circuit at resonance is called rejecter circuit?

OR

Derive the relation between line voltage & phase voltage in case of three phase star connected balanced load. Three identical coils of resistance 8 Ω and inductive reactance 6 Ω are connected in delta across 415V mains. Determine power, power factor and line current

Q.4 (CO-3) : Write down the expression of efficiency for a single phase transformer. Deduce the condition for maximum efficiency of transformer and prove that

$$(KVA)_{max} = (KVA)_{rated}\sqrt{\frac{P_{core}}{P_{physical\ cond.}}}$$

OR

A 40 KVA transformer has a core loss of 400W and full load cu loss of 800W. If the power factor of the load is 0.9 lagging, Calculate :- i) The full load efficiency ii) Efficiency at half load unity power factor (iii) KVA supplied at maximum efficiency iv) Maximum efficiency at 0.9 p.f. lagging

Q.5 (CO-4) : Derive the e.m.f. equation of dc generator. A 4 pole, lap wound dc generator has a useful flux of 70 mWb per pole. Calculate the generated e.m.f. when it is rotated at a speed of 900 r.p.m. with the help of prime mover. Armature consists of 220 number of turns.

OR

Discuss why single phase induction motor is not self starting? What are its methods of starting? Explain any two types with phasor diagram.

Q.6 (CO-5) : Define all characteristics of a battery.

OR

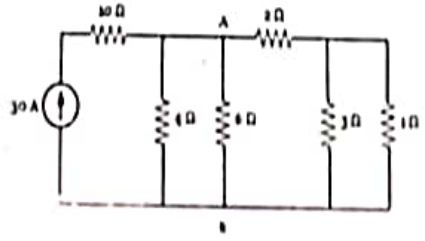
Define electrical Characteristics of a battery. An alkaline cell is discharged at a steady current of 4 ampere for 12 hours, the average terminal voltage being 1.2 V. To restore it to original state of voltage, a steady current of 3 A for 20 hours is required, the average terminal voltage being 1.44 V. Calculate the ampere-hour and watt-hour efficiencies in this particular case.

## Section – C # 50 Marks (Medium / Long Answer Type Questions)

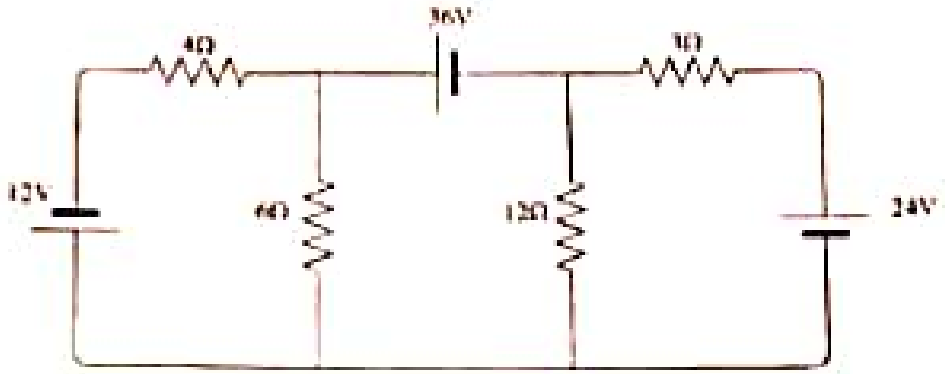
Attempt **ALL** the questions. Each Question is of 10 marks

Q.7 (CO-1) : Attempt any **TWO** question. Each question is of 5 marks

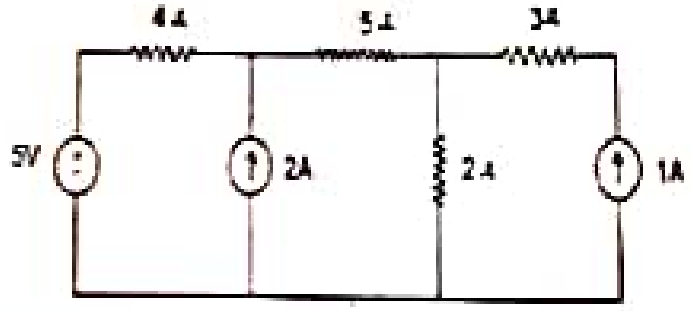
a. Determine the current Through A-B by using Nodal Analysis



b. Calculate current in 12 Ω resistance by using nodal analysis.




c. Find the current in in 2 Ωresistance using mesh analysis




Q.8 (CO-2) : Attempt any **ONE** questions. Each question is of 10 marks.

a. Explain the phenomenon of resonance in series R L C circuit. Derive resonant frequency and draw resonance curve.

b. Show the resonant frequency is the geometric mean of upper and lower half power frequencies.

Q.9 (CO-3) : Attempt any **ONE** questions. Each question is of 10 marks.

a. Derive the e.m.f equation of a transformer and draw the equivalent circuit diagram of a transformer refer to primary side.

b. A wrought iron bar 30 cm long and 2 cm in diameter is bent into a circular shape. It is then wound with 500 turns of wire Calculate the current required to produce a flux of 0.5 mwb in magnetic ckt with an air gap of 1 mm Assume $\mu_r = 4000$

Q.10 (CO-4) : Attempt any **ONE** questions. Each question is of 10 marks.

a. Draw and explain slip-torque characteristics of 3-Φ induction motor and mention all regions ofoperations.

A 3-phase induction motor has a no load & full load speed of 1000 rpm & 960 rpm respectively. Calculate:- (i)slip (ii) frequencyof rotor induced e.m.f (iii) speed of rotor field w.r.t rotor structure (iv) speed of rotor field w.r.t to stator structure (v) speed of rotor field w.r.t to stator field

b. Derive the torque equation of D.C Motor. A 25 KW, 250 volt dc shunt generator has armature and field resistances of 0.06 Ω and 100 Ω respectively. Determine the total power developed when working as a generator delivering 25KW output

Q.11 (CO-5) : Attempt any **TWO** questions. Each question is of 5 marks

a. Write short notes on

(i) SFU (ii) MCB (iii) MCCB

b. Write short notes on

(i)ACB (ii) Types of wires and cables

c. Explain the working of ELCB with neat and clean diagram.