Total No. of Questions : 4]

SEAT No. :

P1272

[Total No. of Pages : 2

# OCT/FE/INSEM-5
# F.E. (Semester - I)
# BASIC ELECTRICAL ENGINEERING (All Branches)
# (2019 Pattern)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat Diagrams must be drawn wherever necessary.***
3) ***Figures to right indicate full marks.***
4) ***Use of Non-Programmable Scientific Calculators is allowed.***
5) ***Assume Suitable Data if necessary.***

***Q1)*** a) Define reluctance. State its unit. Also state the factors on which it depends. **[3]**

b) Compare Electric and magnetic circuit stating clearly similar and dissimilar points. **[6]**

c) A coil of 500 turns is uniformly wound on iron ring of mean circumference 25 cm having area of cross section 15 $cm^2$ . When coil carry current of 1A, produces flux density of 0.8 T. Calculate – (i) magnetizing force H (ii) flux (iii) inductance (iv) relative permeability of iron. **[6]**

OR

***Q2)*** a) State Faradays first and second laws of electromagnetic induction. **[3]**

b) Obtain the expression for coefficient of coupling between two magnetically coupled coils. **[6]**

c) An iron ring of mean diameter 20 cm has square area of cross section of 2 cm x 2 cm and is uniformly wound with 600 turns. The relative permeability of iron is 1000. Calculate (i) Self inductance of coil (ii) If permeability of iron is doubled, find new value of inductance. **[6]**

***P.T.O.***

***Q3)*** a) A sinusoidally varying a.c. voltage is given by $v = 141.4 \sin(100 \pi t)$ volt. Find its (i) RMS value (ii) average value (iii) frequency **[3]**

b) Derive the expression for energy stored in Electric field. **[6]**

c) Obtain the expression for RMS value of sinusoidally varying alternating current in terms of its peak value by analytical method. **[6]**

OR

***Q4)*** a) Covert polar to rectangular Or rectangular to polar form

(i) $5 + j10$ (ii) $6 - j8$ (iii) $5 \angle -36.87^0$ **[3]**

b) The RMS value of 50 Hz sinusoidally varying alternating current is 20A. When t = 0, its value is 10A. Obtain the equation of current. Find the value of current when t = 0.002 second. Also sketch the waveform. **[6]**

c) Sketch the curves for voltage across the charging capacitor and charging current when charged through resistance R and connected DC voltage. Also write down the expression for (i) voltage across the capacitor (ii) charging current (iii) time constant (iv) initial charging current. **[6]**

Total No. of Questions—**8**] [Total No. of Printed Pages—**4**

| **Seat No.** | |
|---|---|

# [5667]-1007

## F.E. (All Branches) (I Sem.) EXAMINATION, 2019
## BASIC ELECTRICAL ENGINEERING
## (2019 PATTERN)

**Time : 2½ Hours** **Maximum Marks : 70**

***N.B.*** **:—** (*i*) Answer Q. **1** *or* Q. **2**, Q. **3** *or* Q. **4**, Q. **5** *or* Q. **6** and Q. **7** *or* Q. **8**.

(*ii*) Neat diagram must be drawn wherever necessary.

(*iii*) Figures to the right indicate full marks.

(*iv*) Use of Non-Programmable Scientific Calculators is allowed.

(*v*) Assume suitable data, if necessary.

**1.** (*a*) Define active, reactive and apparent power. State their units. Also draw the power triangle for R-L circuit. [4]

(*b*) What is series resonance ? Derive the expression for resonant frequency. [6]

(*c*) The R-L circuit when supplied by 180V, 50 Hz ac voltage, the voltage drop across the inductance is 150 V. The current drawn by the circuit is 5 A. Calculate : [8]

(*i*) inductive reactance

(*ii*) inductance

(*iii*) resistance

(*iv*) $V_R$

(*v*) P.F.

(*vi*) Phasor diagram.

P.T.O.

*Or*

**2.** (*a*) Obtain the expression for current, when voltage $v = V_m$, sin $\omega t$ is applied across purely inductive circuit. [4]

(*b*) Derive the expression for power, when voltage $v = V_m$, sin $\omega t$ is applied across R-L series circuit. Draw the phasor diagram. [6]

(*c*) The ac voltage given by $v = 141.4 \sin (100 \pi t + \pi/3)$ Volt, when applied to certain circuit, resultant current is $i = 7.07 \sin (100 \pi t + \pi/6)$ Amp. Draw the phasor diagram and Find : [8]

(*i*) impedance

(*ii*) circuit elements

(*iii*) active, reactive and apparent power.

**3.** (*a*) Define : [3]

(*i*) phase sequence

(*ii*) balanced and unbalanced load.

(*b*) Derive the emf equation of 1-phase transformer. [6]

(*c*) Three identical impedances each of $8 + j6\ \Omega$ are connected in star across 3-ph, 415 V, 50 Hz ac supply. Calculate :

(*i*) line voltage, phase voltage

(*ii*) phase current, line current

(*iii*) active power

(*iv*) When same impedances are connected in delta across the same supply voltage, find active power. [8]

*Or*

**4.** (*a*) Why are steel laminations used for construction of transformer core ? Sketch different types of laminations used for core. [3]

(*b*) What are losses taking place in the transformer ? State the parts in which they takes place. How to minimize these losses ? [6]

(*c*) Obtain the relation between phase values and line values of voltage and current in case of balanced star connected 3-ph inductive load. Assume phase sequence RYB. Draw the necessary phasor diagram. [8]

**5.** (*a*) Define the ideal and practical voltage sources. Draw their V-I characteristics. [4]

(*b*) Find current flowing through AB using Kirchhoff's loop analysis for the circuit shown in Fig. 5(*b*). All resistances are in Ω. [6]

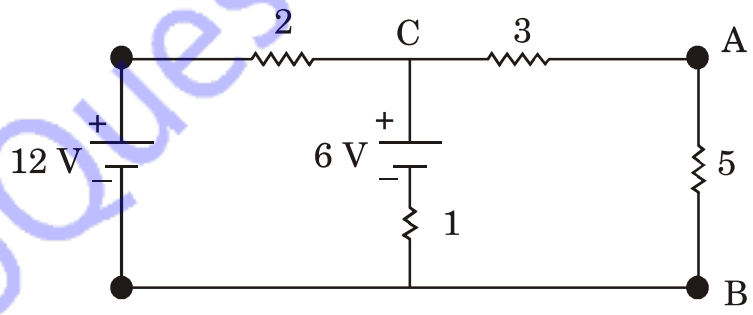


Fig. 5(*b*)

(*c*) Derive the equations to convert Delta connected resistive circuit into equivalent star circuit. [8]

*Or*

**6.** (*a*) State and explain KCL & KVL. [4]

(*b*) Define :

(*i*) active & passive network

(*ii*) linear & nonlinear network.

(*iii*) unilateral & bilateral network. [6]

(*c*) Find current flowing through 3 Ω using Superposition theorem for the circuit shown in Q 5(*b*) Fig. 5(*b*). [8]

**7.** (*a*) Define temperature coefficient of resistance. State the factors on which it depends. [3]

(*b*) Compare lead acid battery and lithium ion battery. (6 points only). [6]

(*c*) The electrical load of a bungalow is as follows. Find :

(*i*) daily energy consumption in kWh.

(*ii*) monthly electricity bill for the month of 30 days at the rate of Rs 6/unit.

| | | | | | | |
|---|---|---|---|---|---|---|
| (I) | Tubes | 40 W | ---- | 06 nos | ---- | 6 hrs/day |
| (II) | Fans | 60 W | ---- | 04 nos | ---- | 10 hrs/day |
| (III) | Washing machine | 2 kW | ---- | 01 no | ---- | 01 hr/day |
| (IV) | Geyser | 2 kW | ---- | 01 no | ---- | 02 hrs/day |
| (V) | TV | 100 W | ---- | 01 no | ---- | 06 hrs/day [8] |

*Or*

**8.** (*a*) State the applications of lead acid battery. [3]

(*b*) Prove that $\alpha_2 = \alpha_1/1 + \alpha_1 (t_2 - t_1)$, all the symbols have their appropriate meaning. [6]

(*c*) Explain the operation of Lithium ion battery with construction & chemical reactions during charging and discharging. Also state its applications. [8]

Total No. of Questions :4]

SEAT No. :

**P4**

[Total No. of Pages : 2

# FE/Insem./APR-4
# F.E (Semester - II)
# 103004 : BASIC ELECTRICAL ENGINEERING
# (2019 Pattern)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Answer Q1 or Q2, Q3 or Q4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figure to right indicate full marks.***
4) ***Use of Non-Programmable Scientific Calculators is allowed.***
5) ***Assume Suitable Data if necessary.***

***Q1)*** a) Define the terms:

i) Reluctance ii) Magnetic Flux Density and iii) Mutual inductance **[3]**

b) Compare Electric circuit and Magnetic circuit, clearing stating similar and dissimilar points. **[6]**

c) Iron ring of mean diameter 25 cm & relative permeability of 1000 is uniformly wound with 500 turns. Find current required to produce a flux density of 1 Tesla in the ring. If an air gap of 1 mm is cut in the ring, calculate new value of current to maintain the same flux density in the ring. **[6]**

OR

***Q2)*** a) Compare series & parallel magnetic circuits. **[3]**

b) Derive the expression for energy stored in an inductor. **[6]**

c) Two coils A & B have self inductances of 120 μH and 300 μH respectively. A current of 2 Amp in coil A, produces flux linkage of 200 μ Wb - turns in coil B. Calculate -

i) Mutual inductance ii) Coefficient of coupling k &

iii) Average emf induced in coil B, when the current in coil A is switched off in 0.05 sec. **[6]**

***P.T.O.***

***Q3)*** a) Obtain the expression for capacitance of parallel plate capacitor. **[3]**

b) Derive the expression for rms value of a sinusoidal alternating current in terms of its peak value. **[6]**

c) Three capacitors 2 μF, 4 μF, and 6 μF, are connected in series across 200 V DC supply. Find equivalent capacitance and voltage across each capacitor. **[6]**

OR

***Q4)*** a) An alternating voltage is given is by v=141.4 sin 377 t. Find its

i) RMS value ii) average value iii) frequency **[3]**

b) Derive the expression for average value of a sinusoidal alternating current in terms of its peak value. Also write the formula for

i) Form Factor and ii) Amplitude Factor **[6]**

c) The rms value of 50 Hz sinusoidal alternating current is 20A. At t=0, its value becomes 10A. Write down the equation for current. Also find the magnitude of current at t=6 ms. **[6]**

Total No. of Questions : 8]

SEAT No. :

**P6489**

[Total No. of Pages : 4

# [5868]-105
# F.E. (All Branches)
# 103004 : BASIC ELECTRICAL ENGINEERING
# (2019 Pattern) (Semester - I/II)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) Define and state the unit of admittance, conductance & susceptance. Also draw the admittance triangle for inductive circuit. **[4]**

b) Obtain the expression for current and power, when voltage $v = V_m \sin \omega t$ is applied across purely resistive circuit. Also draw the waveform for voltage, current & power on common X-axis. **[6]**

c) The series circuit having resistance 5 Ω, inductance 0.1 H and capacitance 150 μF is connected to 1-phase, 200 V, 50 Hz AC supply. Calculate- **[8]**

i) Inductive reactance XL
ii) Capacitive reactance Xc
iii) Net reactance X
iv) Impedance Z
v) Current drawn by the circuit
vi) Power factor
vii) Active power P
viii) Reactive power Q

OR

***Q2)*** a) Define and state the unit of active, reactive and apparent power in case of single phase circuit. Draw the power triangle. **[4]**

b) Derive the expression for resonant frequency and comment on impedance, current and power factor in case of series resonance circuit. **[6]**

c) Derive the expression for power, when voltage $v = V_m \sin \omega t$ is applied across R-L series circuit. Also draw the waveform for voltage, current & power on common X-axis. **[8]**

***P.T.O.***

***Q3)*** a) What is phase sequence? State it's any two applications. **[3]**

b) State the relation between : **[6]**

i) Phase voltage and line voltage

ii) Phase current and line current in case of balanced delta connected 3-ph load. Using above relations, obtain the expressions for 3-ph active power and 3-ph reactive power.

c) A 80 kVA, 1000/250 V, 1-ph 50 Hz transformer has iron loss of 1000 W and copper loss 400 W, when its primary draws current of 50A. Calculate **[8]**

i) Efficiency at full load and power factor = 0.8 lag.

ii) Efficiency at half load and power factor = 1 lag.

OR

***Q4)*** a) What are the losses in the transformer? State the parts in which they take place. **[3]**

b) Derive the EMF equation of single phase transformer. **[6]**

c) Three identical impedances each of 6+j8 Ω are connected in star across 3-ph, 415 V, 50 Hz ac supply. Determine **[8]**

i) Line voltage

ii) Phase voltage

iii) Phase current and line current

iv) 3-ph active, reactive and apparent power

***Q5)*** a) Define the practical voltage source & explain it by means of **[4]**

i) Symbol of representation

ii) Value of internal resistance

iii) Graphs between V and I

b) Derive the equations to convert Delta connected resistive circuit into equivalent Star circuit. **[6]**

c) For the circuit given in fig 5c, write down the steps to find current through PQ using Superposition Theorem. **[8]**

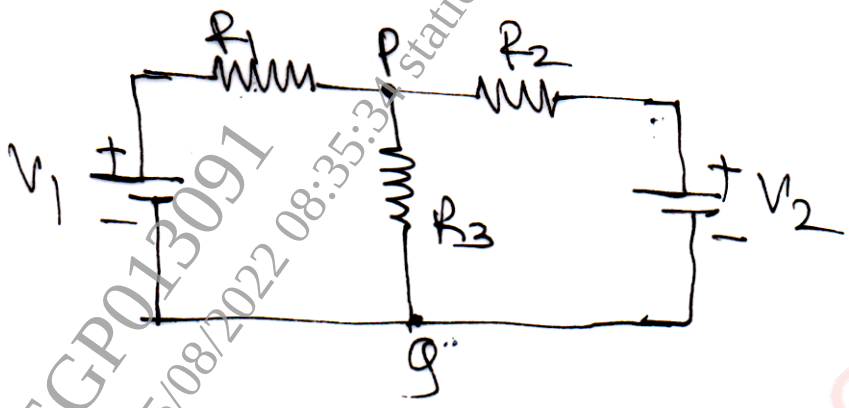


Figure 5c

OR

***Q6)*** a) State and explain KCL & KVL **[4]**

b) Calculate the current flowing through 6 Ω (AB) for the circuit shown in fig 6b, using Kirchhoff's Laws. **[6]**


Figure 6b

c) Calculate the current flowing through 6 Ω (AB) for the circuit shown in question 6b, using Thevenin's Theorem. **[8]**

***Q7)*** a) Define resistivity of the material & state the factors on which it depends. **[3]**

b) Explain construction and working principle of Lithium Ion battery and state it's any two applications. **[6]**

c) Derive an expression for insulation resistance of a single core cable. Draw the necessary diagram. Also comment on insulation resistance when **[8]**

i) Two cables are connected in series and

ii) In parallel

OR

***Q8)*** a) Write the name of materials used for anode, cathode and electrolyte in case of Lead Acid Battery. State it's any three applications. **[3]**

b) If $\alpha_1$ and $\alpha_2$ are the RTC of a conducting material at $t_1^0$C and $t_2^0$C respectively prove that $\alpha_2 = \frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$ **[6]**

c) A water pump lifts 12000 litre of water to a height of 15 m per minute. The efficiency of motor and pump is 75% & 80% respectively. Calculate **[8]**

i) Input power to motor in kW

ii) Daily energy consumption if pump is used 04 hrs a day

iii) Monthly electricity bill as per above daily uses for the month of 30 days at the rate of 10 Rs/unit.

Total No. of Questions : 4]

SEAT No. :

**PA-1682**

[Total No. of Pages : 2

**[5931]-1005**

# First Year Engineering (All Branches)
# BASIC ELECTRICAL ENGINEERING
# (2019 Pattern) (Semester - I) (103004)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Solve Q.1 or Q.2, Q.3 or Q.4.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) What is magnetic effect of an electric current in case of a long straight conductor? Hence state right hand thumb rule. **[3]**

b) Distinguish between an electric circuit and a magnetic circuit; stating similarities (04 points) and dissimilarities (02 points) **[6]**

c) Two coils A and B have self-inductances of 10 μH and 40 μH respectively. A current of 2 A in coil A produces a flux a linkage of 5μWb-turns in coil B. Calculate: **[6]**

i) Mutual inductance between the coils

ii) Coefficient of coupling

iii) Average emf induced in coil B if the current of 1 A in coil A is reversed at uniform rate in 0.1 second.

OR

***Q2)*** a) Define Self Inductance by three ways. **[3]**

b) Obtain the expression for energy stored in magnetic field produced by an inductor. **[6]**

c) An iron ring of mean circumference of 150cm and cross sectional area 12 $cm^2$ is wound with 600 turns of coil. The coil produces flux of 1.25 mWb while carrying a current of 2 A. Find the relative permeability of iron. **[6]**

***Q3)*** a) Define **[3]**

i) cycle

ii) period and

iii) frequency of an alternating quantity.

***P.T.O.***

b) Explain the concept of lagging taking two electrical quantities with the help of their waveforms and phasor diagrams. **[6]**

c) Two capacitors of 2 μF and 8 μF are connected in series across 200 V DC supply. **[6]**

Find

i) resultant capacitance value

ii) voltage across each capacitor and

iii) charge on each capacitor.

OR

***Q4)*** a) Obtain an expression for average value of a sinusoidal alternating current. **[3]**

b) Define the following terms in electrostatics and mention their units. **[6]**

i) Electric flux density

ii) Electric field strength

iii) Absolute permitivity

c) An alternating current varying sinusoidally with a frequency of 50 Hz has an rms value of 10 A. Write the expression for instantaneous value of this current quantity and find its value for **[6]**

i) t = 0.0015 sec

ii) t = 0.0075 sec after passing through zero and then increasing negatively.

✠ ✠ ✠

Total No. of Questions : 4]

SEAT No. :

P-5371

[Total No. of Pages : 2

# [6185]-54

## F.E. (All Branches) (Insem.)

## BASIC ELECTRICAL ENGINEERING

## (2019 Pattern) (Semester - I) (103004)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Solve Q1 or Q2 and Q3 or Q4.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) Derive an expression for Energy stored per unit volume in the magnetic field. **[7]**

b) Two coils having turns 1000 and 1500 are placed on common magnetic circuit. A current of 5A in coil-1 produces a flux of 0.2 mWb and 80% of this flux links to coil-2 . Find **[8]**

i) Self Inductance of coil-1

ii) Mutual Inductance between them

iii) If this current in first coil is interrupted in 0.01 sec find emf induced in coil-1 and coil-2

OR

***Q2)*** a) Obtain an expression for coefficient of coupling between two magnetically coupled coils. **[7]**

b) i) Derive the expression for flux, for iron ring wound with N turns & current is passed through it.

ii) Define the reluctance & state the factors on which it depends.

**[8]**

***P.T.O.***

***Q3)*** a) Define the RMS value of current and obtain the expression for RMS value of sinusoidally varying alternating current in terms of its peak value. **[7]**

b) An air capacitor has two parallel plates of 10 cm × 10 cm and plates are separated by 1 cm. Find **[8]**

i) Capacitance

ii) Potential difference, when charge of 500 μC is applied.

iii) If air is replaced by dielectric material having relative permittivity $\varepsilon_r = 4$, find new value of capacitance & potential difference when same charge is applied.

OR

***Q4)*** a) Explain the concept of phase lag & phase lead by using : **[7]**

i) mathematical equations

ii) waveform and

iii) phasor diagram.

b) A sinusoidally varying alternating voltage of 100 V (rms value) with 50 Hz frequency is applied to a circuit find : **[8]**

i) The mathematical equation of the voltage;

ii) Time Period

iii) The instantaneous voltage when t = 1.667 ms;

iv) The time when instantaneous voltage is 100 V;

v) Average value of the voltage

vi) Maximum value of the voltage.

⌘⌘⌘

Total No. of Questions : 8]

SEAT No. :

**P3663**

[Total No. of Pages : 4

# [6001]-4005
# F.E. (All Branches)
# BASIC ELECTRICAL ENGINEERING
## (2019 Credit Pattern) (Semester - I/II) (103004)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programable calculator is allowed.***

***Q1)*** a) Define impedance. Draw the impedance triangle for R-L & R-C series circuit. **[4]**

b) Obtain the expression for current and power, when voltage $v = V_m \sin \omega t$ is applied across purely inductive circuit. **[6]**

c) The series circuit having resistance 10 Ω, inductance 0.1 H and capacitance 150 μF is connected to 1-phase, 200 V, 50 Hz AC supply, Calculate - **[8]**

i) Inductive reactance Xl

ii) Capacitive reactance Xc

iii) Net reactance X

iv) Impedance Z

v) Current drawn by the circuit

vi) Power factor

vii) Active power P

viii) Reactive power Q.

OR

***Q2)*** a) If 200 V, 50 Hz supply is applied across the resistance of 10 Ω, find equation for voltage & current. **[4]**

***P.T.O.***

b) Derive the expression for power, when voltage $v = V_m \sin \omega t$ is applied across R-L series circuit. **[6]**

c) The series circuit having resistance 10 Ω and capacitance 150 μF draws a current of 9.4 A from 1-phase, 50 Hz AC supply. Calculate -

i) Capacitive reactance

ii) impedance

iii) power factor

iv) supply voltage

v) Active power and

vi) reactive power. **[8]**

***Q3)*** a) Define

i) Balanced load

ii) Unbalanced load and

iii) Phase sequence. **[3]**

b) Derive the EMF equation of single phase transformer. **[6]**

c) Derive the relation between i) phase voltage and line voltage ii) phase current and line current in case of balanced STAR connected 3-ph inductive load. Assume phase sequence RYB. Draw the circuit diagram & necessary phasor diagram. **[8]**

OR

***Q4)*** a) Define the voltage regulation and efficiency of transformer along with formula. **[3]**

b) The maximum flux density in core of a 250/1000 V, 50 Hz, 1-ph transformer is 1.2 T. If EMF/turn is 10 V, calculate i) Primary & secondary number of turns ii) area of cross section of core. **[6]**

c) Three identical impedances each of 6+j8 Ω are connected in star across 3-ph, 400 V, 50 Hz ac supply. Determine. **[8]**

i) phase voltage

ii) phase current and line current

iii) power factor, 3-ph active, reactive and apparent power

***Q5)*** a) State and explain KCL & KVL **[4]**

b) Calculate the current flowing through 4 Ω (AB) for the circuit shown in fig 5b, using Kirchhoff's Laws. All resistances are in Ω **[6]**

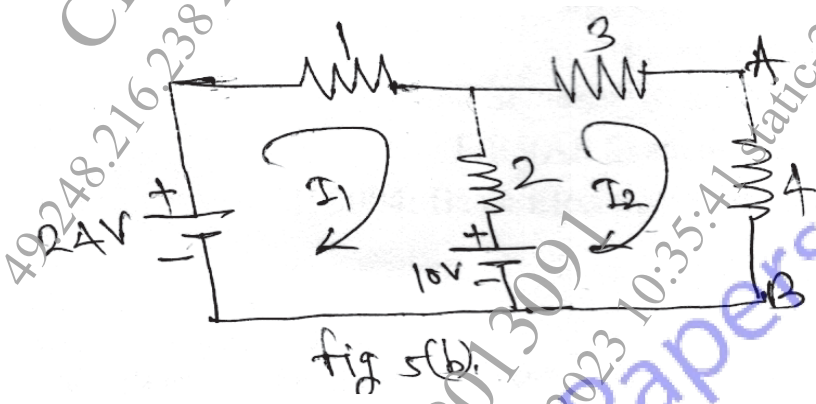

fig 5(b).

c) Derive the equations to convert Delta connected resistive circuit into equivalent Star circuit. **[8]**

OR

***Q6)*** a) Explain the practical current source by means of **[4]**

i) Symbol of representation

ii) Value of internal resistance

iii) Graphs between V and I

b) Calculate the current flowing through 4 Ω (PQ) for the circuit shown in fig 6b, using Superposition Theorem. All resistances are in Ω **[6]**

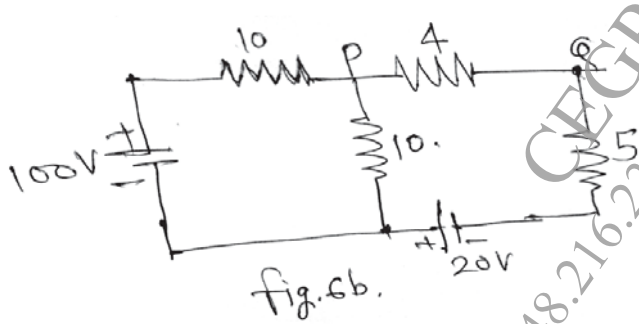

fig.6b.

c) Calculate the current flowing through 4 Ω (PQ) for the circuit shown in fig 6b, using Thevenin's Theorem. **[8]**

***Q7)*** a) Define resistance of the material & state factors on which it depends. **[3]**

b) Explain construction and working principle of Lithium ion battery. **[6]**

c) Derive an expression for insulation resistance of a single core cable with the necessary diagram. **[8]**

OR

***Q8)*** a) State the material used for positive plate, negative plate & electrolyte for lead acid battery. **[3]**

b) The current flowing at the instant of switching 240 V, 40 Watt lamp is 2 A. The TCR of tungsten filament is 0.0055 per degree Celsius at 20ºC. Determine. **[6]**

i) temperature of filament of the lamp ii) working current

c) If $\alpha_1$ and $\alpha_2$ are the RTC of a conducting material at $t_1^0$C and $t_2^0$C respectively prove that $\alpha_2 = \dfrac{\alpha_1}{1+\alpha_1(t_2 - t_1)}$ & hence, obtain $\alpha_t = \alpha_0 / (1+\alpha_0.t)$ **[8]**

Total No. of Questions : 8]

SEAT No. :

**P9070**

[Total No. of Pages : 3

**[6178]-5**

**F.E. (All Branches)**

**BASIC ELECTRICAL ENGINEERING**

**(2019 Pattern) (Credit System) (Semester - I/II) (103004)**

*Time : 2½ Hours]* *[Max. Marks : 70*

*Instructions to the candidates:*

1) *AttemptQ.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*
5) *Use of non-programmable electronic pocket calculator is permitted.*

***Q1)*** a) Derive the expression for resonant frequency in an RLC series circuit. **[4]**

b) A sinusoidal AC voltage given by $v = Vm \sin \omega t$ is applied across a pure inductor. Obtain the following for this circuit: **[6]**

i) Expression for the instantaneous current
ii) Phasor diagram. waveforms of instantaneous voltage and current
iii) Expression for the instantaneous power

c) A coil of resistance 24 Ω has a reactance of 32 Ω when connected across a single phase voltage given by $v = 566 \sin 314t$. Find: **[8]**

i) Frequency
ii) Rms value of current
iii) Power factor
iv) Equation of the resultant current

OR

***Q2)*** a) State the power factor in case of following circuits: **[4]**

i) A purely resistive circuit
ii) A purely inductive circuit
iii) A purely capacitive circuit
iv) An RLC series circuit under resonance

b) Obtain the expression for power in an R-C series circuit when supplied with $v = Vm \sin wt$. **[6]**

c) A series R-L-C circuit consists of R = 10 Ω, L = 0.318 H and C = 63.6 µF. This circuit is supplied by source of emf given by $e(t) = 100 \sin 314t$. Find: **[8]**

i) Expression for i (t)
ii) Phase angle between voltage and current
iii) Power factor of circuit
iv) Active power consumed

***P.T.O.***

***Q3)*** a) Define the following in the context of three phase AC systems: **[3]**

i) Symmetrical AC supply

ii) Phase Sequence

iii) Balanced Load

b) Derive the emf equation of a single phase transformer. Hence obtain the transformation ratio. **[6]**

c) Three impedances each of (3- j4) Ω are connected in delta across a 3-phase. 230 V supply. Calculate: **[8]**

i) Phase and line currents

ii) Power factor of the load

iii) Power delivered to the load

OR

***Q4)*** a) Compare an autotransformer with a conventional two-winding transformer by mentioning any three differences. **[3]**

b) Prove that the three phase delta connected balanced load consumes thrice the power consumed by that of the star connected load. **[6]**

c) The primary winding of a single phase transformer is connected to a 230 V, 50 Hz supply. The secondary winding has 1500 turns. If the maximum value of the core flux is 0.00215 Wb, determine **[8]**

i) secondary induced emf

ii) number of turns in the primary

iii) cross sectional area of the core if the maximum value of flux density is 0.1 T

iv) whether it is a step up or a step down transformer?

***Q5)*** a) State and briefly explain Kirchhoff's Laws for DC circuits. **[4]**

b) Obtain the relations for converting delta connected resistances into equivalent star connection. **[6]**

c) Find the current through 1Ω resistance of the circuit shown in Fig. 1 below using Thevenin's Theorem. **[8]**

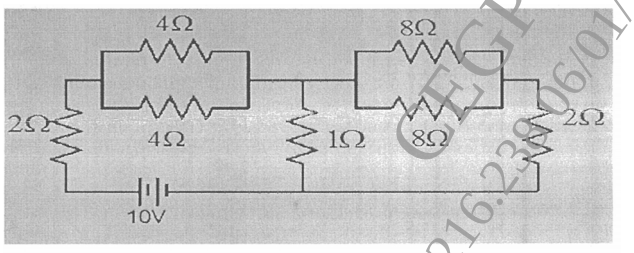


Fig.1

OR

***Q6)*** a) Define the following terms: **[4]**

i) Active Network and Passive Network

ii) Lumped Network and Distributed Network

b) Find the current through branch AB of the circuit shown in Fig.2 below by applying Kirchhoff's Laws. **[6]**

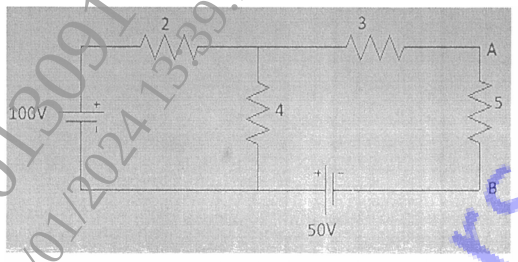


Fig.2

c) State Superposition Theorem. Find the current through branch AB of the circuit shown in Fig.2 above by applying Superposition Theorem. **[8]**

***Q7)*** a) Define the temperature coefficient of resistance of a material and state its unit. **[3]**

b) Explain the construction and working of a Lead Acid Battery with the help of suitable diagram and chemical equations. **[6]**

c) An electric kettle is required to heat 5 liters of water from 15°C to 96°C in 30 minutes. Find the input power of the kettle assuming the efficiency of 80 %. If the kettle operates on 230 V mains, find the resistance of the heating element. Assume the specific heat capacity of water to be 4200.J/kg. K and 1 liter of water as equivalent to a mass of 1kg. **[8]**

OR

***Q8)*** a) Write your choice of either a lead acid battery or a lithium ion battery for the following applications: **[3]**

i) Mobile phone

ii) Electric bike

iii) Conventional petroleum vehicle

b) An electric motor runs at 500 rpm while producing torque of 20 Nm. The motor operates at efficiency of 85%. Find motor input power and current drawn when the motor is fed from 230V DC supply. **[6]**

c) Define insulation resistance and derive the expression for insulation resistance of a single core cable. **[8]**

✪ ✪ ✪

Total No. of Questions : 4]

SEAT No. :

**PB4**

[Total No. of Pages : 2

# [6267]-4
## F.E (All Branches)(Insem)
## BASIC ELECTRICAL ENGINEERING
## (2019 Pattern) (Semester -I/II) (103004)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicates full mark***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable electronic calculator is allowed***

***Q1)*** a) Obtain the expression for the mutually induced emf in a coil when the neighboring coil is excited by a current. Draw the circuit diagram and mention all the natations clearly. **[7]**

b) A magnetic circuit consists of an iron ring of mean circumference 80 cm with cross sectional area 12cm$^2$. A current of 2 A in the magnetizing coil of 200 turns produces a total flux of 1.2mWb in the iron. **[8]**

Calculate:

i) flux density in the iron

ii) absolute and relative permeability of iron

iii) reluctance of the circuit

OR

***Q2)*** a) Derive the expression for the energy. stored in the magnetic field of a coil and hence, the energy stored per unit volume of the circuit. **[7]**

b) Two coils having 50 and 500 turns respectively are wound side by side on a closed iron circuit of cross section 50cm$^2$ and mean length 120 cm. **[8]**

i) Estimate the mutual inductance between the coils if the permeability of iron is 1000.

ii) Find the self-inductance of each coil.

iii) If the current in one coil increases steadily from zero to 5 A in 0.01 second, find the emf induced in the other coil.

***P.T.O.***

***Q3)*** a) What is phase? Explain the concepts of phase lag between two alternating quantities by **[7]**

i) Mathematical equations

ii) Drawing waveforms and phasor diagrams.

b) Three sinusoidally alternating currents varying at 50Hz have rms values 5 A, 7.5 A and 10 A with phase angles of 30º, – 60º and 45º respectively. **[8]**

i) Find their average values

ii) Write equations for their instantaneous values

iii) Find the instantaneous values of 10 A current at 100 mSec.

OR

***Q4)*** a) Obtain the rms value of a sinusoidal alternating current in terms of its peak value and hence find the peak factor. **[7]**

b) A potential difference of 10 kV is applied to the terminals of a 300 pF capacitor with two rectangular plates each having an area of 100cm$^2$ and separated by a dielectric 1 mm thick. **[8]**

Calculate:

i) Total charge

ii) Electric flux density

iii) Relative permittivity of the dielectric

* * *

Total No. of Questions : 8]

SEAT No. :

**PB3590**

[Total No. of Pages : 3

**[6260]-5**

**F.E. (All Branches)**

**BASIC ELECTRICAL ENGINEERING**

**(2019 Pattern) (Semester - I & II) (Credit System) (103004)**

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***
5) ***Use of non-programmable electronic pocket calculator is permitted.***

***Q1)*** a) Derive the expression for resonant frequency in a series RLC circuit. **[4]**

b) Prove that a pure inductor excited by sinusoidal voltage source never consumes any power. Draw the circuit diagram and write all necessary equations in steps. **[6]**

c) A voltage given by $v = 200 \sin \omega t$ is applied across 50 Ω pure resistor. Obtain the expressions for instantaneous current and instantaneous power for this circuit. Also calculate rms value of current and power consumed. **[8]**

OR

***Q2)*** a) Define admittance of a circuit and hence draw the admittance triangle for a capacitive circuit. **[4]**

b) Obtain the expressions for instantaneous power and average power in a series R-L circuit excited by purely sinusoidal voltage. **[6]**

c) An R-C series circuit dissipates 100 W at 0.75 leading power factor when connected across single phase. 230 V, 50 Hz sinusoidal AC supply. Calculate: **[8]**

i) current drawn

ii) impedance in polar and rectangular form

iii) resistance of the circuit and

iv) value of capacitance

***P.T.O.***

***Q3)*** a) Define the following terms in the context of polyphase AC circuits: **[3]**

i) Symmetric AC supply

ii) Phase sequence

iii) Balanced Load

b) Derive the emf equations of a single phase transformer. **[6]**

c) A delta connected balanced load consists of three coils; each of resistance 6 Ω and inductive reactance 8 Ω supplied by 400V, 3-phase AC. Determine **[8]**

i) impedance per phase

ii) phase current and line current

iii) power factor of the circuit

iv) total power absorbed

OR

***Q4)*** a) State any three advantages offered by an autotransformer. **[3]**

b) A direct loading test is performed on a 1 KVA, 230V/115 V, 50 Hz single phase transformer. Draw the connection diagram showing all necessary measuring instruments with appropriate ranges and determine the rated primary and secondary current. **[6]**

c) Obtain the relationship between line current and phase current, line voltage and phase voltage for 3-phase star connected balanced inductive load with the help of neat circuit diagram and phasor diagram. Assume phase sequence as RYB. **[8]**

***Q5)*** a) A practical voltage source supplies a load resistance $R_L$ Draw the circuit representation and the $V_L$-$I_L$ characteristics of this arrangement. **[4]**

b) Obtain the formulae for converting a delta connection of resistors into its equivalent star connection. **[6]**

c) Write the Kirchhoffs Voltage Law equations for the circuit shown in Fig. below and hence find the current through branch AB. All resistance values are in Ω. **[8]**

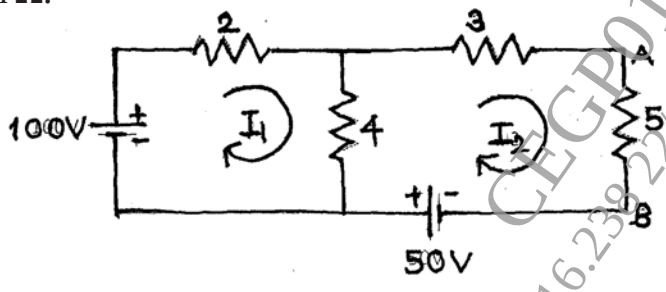


Fig. Q.5 (c)

OR

***Q6)*** a) State and explain Kirchhoff's Laws for DC circuits. **[4]**

b) Find the equivalent resistance obtained across B and C terminals for the circuit shown in Fig. below. All resistance values are in Ω. **[6]**

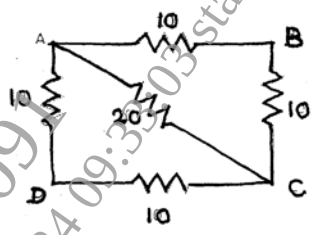


Fig. Q. 6 (b)

c) State Superposition Theorem. Explain the steps to apply Superposition Theorem for finding the current through branch A B of the circuit shown in fig. below. **[8]**

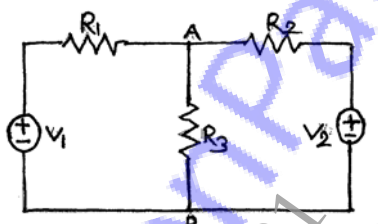


Fig. Q. 6 (C)

***Q7)*** a) Specify the following in case of a Lithium Ion Battery: **[3]**

i) Cathode material

ii) Anode material

iii) Electrolyte material

b) Prove that $\alpha_2 = \dfrac{\alpha_1}{1+\alpha_1(t_2 - t_1)}$ where all terms have their usual meaning. **[6]**

c) Define insulation resistance and hence derive an expression for insulation resistance of a single core cable. **[8]**

OR

***Q8)*** a) Define resistance temperature coefficient (RTC) and write its unit. **[3]**

b) An electric pump lifts 72 $m^3$ of water per hour to a height of 15 m. If the overall efficiency of the system is 70 %, find the input power. If the pump is used for 4 hours in a day, find the daily cost of energy at Rs. 10 per unit. **[6]**

c) Explain the following in case of a Lead Acid Battery: **[8]**

i) Construction and working

ii) Maintenance procedure

iii) Any two applications

Total No. of Questions : 4]

SEAT No. :

**PC377**

[Total No. of Pages : 2

# [6358]-108
## F.E. (All Branches) (Insem)
## BASIC ELECTRICAL ENGINEERING
## (2019 Pattern) (Semester - I) (103004)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates:***

1) ***Attempt Q.1 or Q.2, Q.3 or Q.4.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data if necessary.***

***Q1)*** a) What is electromagnetic induction? State Faraday's Laws of Electromagnetic induction. **[3]**

b) Obtain the expression for coefficient of coupling of two magnetically coupled coils. **[6]**

c) A coil of 500 turns is wound on an iron ring of circular cross sectional area 3 $cm^2$ and mean diameter 20 cm. The magnetic flux produced in the ring is 0.5 mWb when the coil carries 2 A current. Determine the relative permeability of the material. **[6]**

OR

***Q2)*** a) Define magnetic field strength and state it's unit. Write an expression for magnetic field strength at any point in case of the field produced in a solenoid. **[3]**

b) Derive an expression for energy stored in an inductor and hence obtain energy stored per unit volume of it. **[6]**

c) Two perfectly coupled coils have 800 and 600 number of turns respectively. A current of 2A flowing through first coil produces magnetic flux is 5 mWb in it. **[6]**

Calculate:

i) self inductance of first coil and

ii) emf induced in both the coils if the current is turned off in 2 mS.

***P.T.O.***

***Q3)*** a) Define **[3]**

i) instantaneous value

ii) maximum value and

iii) average value in case of sinusoidal alternating quantity.

b) Explain the concept of **[6]**

i) in-phase

ii) lagging phase and

iii) leading phase quantities with the help of suitable wave forms.

c) Obtain the expression for rms value of sinusoidal alternating current in terms of it's maximum value. **[6]**

OR

***Q4)*** a) Define time constant during charging of a capacitor and state it's unit. **[3]**

b) A certain voltage waveform has form factor of 1.15 and peak factor of 1.5. If the maximum value of the voltage is 4500 V, calculate the average and rms values of the voltage. **[6]**

c) Three capacitors and connected in series across 200 V DC supply. The voltage across each capacitor is 50 V, 80 V and 70 V respectively. The charge on each plate of capacitors is 5000 μC. Determine the value of each capacitance and equivalent capacitance value of their series combination. **[6]**

Total No. of Questions : 8]

SEAT No. :

**PE899**

[Total No. of Pages : 4

# [6581]-1905

## F.E. (All Branches)

## BASIC ELECTRICAL ENGINEERING

## (2019 Pattern) (Semester-I/II) (103004)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Solve Q.1 or Q.2; Q.3 or Q.4; Q.5 or Q.6; Q.7or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) Define admittance. State its units. Express admittance in rectangular & polar form. **[4]**

b) Obtain the expression for current when voltage $v = V_m \sin \omega t$ is applied across purely inductive circuit. Also draw the waveform for voltage & current against time as a common X-axis. **[6]**

c) A series R-L-C circuit has resistance of 50 ohms, inductance of 0.1 H and capacitance of 50 micro farads connected across single phase 230 V, 50 Hz AC supply. **[8]**

Calculate:

i) Inductive reactance

ii) Capacitive reactance

iii) Impedance

iv) Current drawn by circuit

v) Power factor of the circuit

vi) Active & Reactive power consumed by the circuit.

OR

***P.T.O.***

***Q2)*** a) Draw power triangle for R-L series circuit. Define active power and state its unit. **[4]**

b) Derive the expression for resonant frequency in case of series RLC a c circuit. Draw phasor diagram. **[6]**

c) A series RC circuit consisting of a resistance of 50 ohm and capacitance of 100 micro farad. It is supplied by 1-ph 230 V, 50 Hz AC supply. Calculate: **[8]**

i) Capacitive reactance
ii) Impedance of the circuit
iii) Current through the circuit
iv) Voltage across resistance
v) Voltage across capacitance
vi) Power factor of circuit
vii) Power consumed by circuit. Also draw a neat phasor diagram

***Q3)*** a) Define : **[3]**

i) Phase sequence
ii) Balanced load
iii) Unbalanced load

b) Derive emf equation of a single phase transformer. **[6]**

c) Three identical impedances each of 6 +j 8 are connected in star across 3 phase 400 V 50 Hz supply. Determine: **[8]**

i) Phase current
ii) Line current
iii) Line & phase voltage
iv) 3-phase active, reactive and apparent power.

OR

***Q4)*** a) State the relation between

i) Phase voltage and line voltage
ii) Phase current and line current in case of balanced delta connected 3-phase load. Write down the expression for 3-phase active power. **[3]**

b) Differentiate core type & shell type transformer construction. (any 6 points). **[6]**

c) A 25 kVA, 50 Hz single phase transformer has iron loss and full load copper loss of 350 watts and 400 watts respectively. Calculate its efficiency at : **[8]**

i) 50 % of full load, at unity power factor and
ii) 75 % of full load at 0.8 lagging power factor.

***Q5)*** a) Explain active & passive networks with respect to D C resistive network. **[4]**

b) Derive the expression to convert given delta connected resistances into equivalent star connected resistances. **[6]**

c) Using Kirchhoff's Law, determine the current $I_1$ & $I_2$. Hence find current in 4 ohm resistance shown below in Fig. 5c. **[8]**

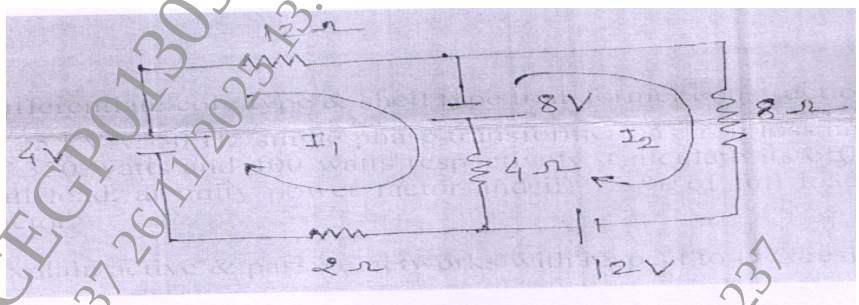


Fig – 5 c

OR

***Q6)*** a) State and explain Kirchhoff's laws. **[4]**

b) Apply Superposition theorem to calculate current flowing in 4 ohms resistance for the network shown below in Fig. 6b **[6]**

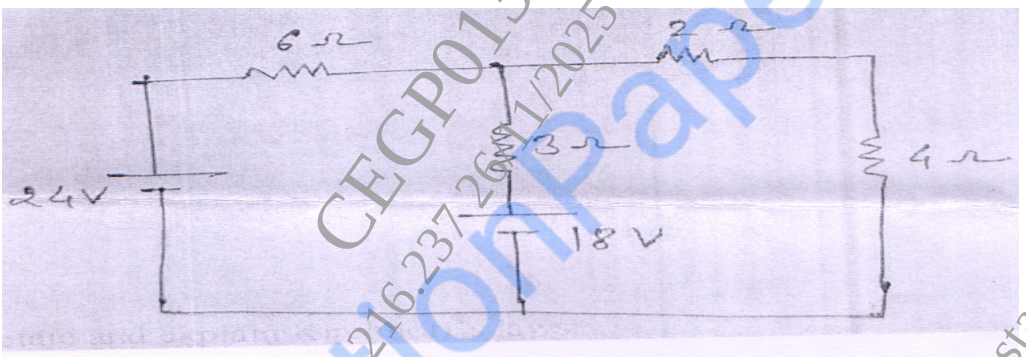


Fig – 6 b

c) Determine the current in 8 ohms resistance connected across A and B by Thevenins theorem ( Ref. Fig -6c). **[8]**

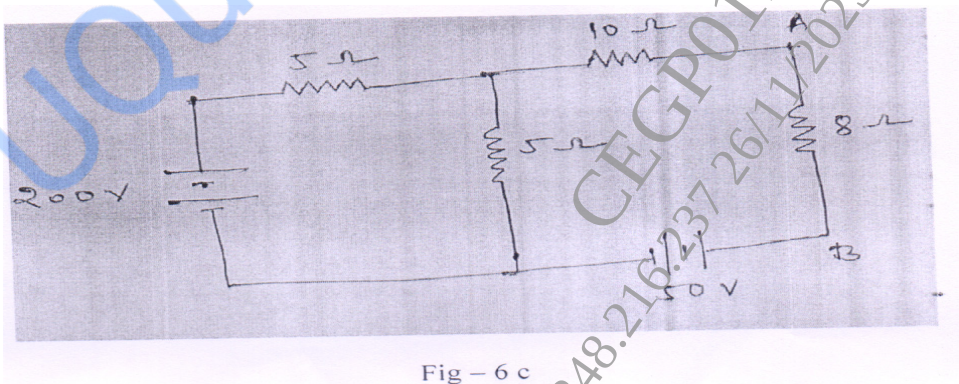


Fig – 6 c

***Q7)*** a) What are the indications of a fully charged lead acid battery? **[3]**

b) With usual notations derive the expression $\alpha_2 = \alpha_1 / (1 + \alpha_1[t_2 - t_1])$. **[6]**

c) An electric pump lifts 1.2 $m^3$ of water per minute to a height of 15 meters. The overall efficiency of pump & motor is 60%. Calculate the input power. If the pump is used 4 hours daily, calculate energy consumption for a month of 30 days at the rate of Rs. 5 per unit. **[8]**

OR

***Q8)*** a) State any three applications of Li Ion battery. **[3]**

b) A single core Copper cable has conductor diameter of 3 cm & insulation thickness of 2 cm. The resistivity of copper & insulation is $1.73 \times 10^{-8}$ ohm meter & $9 \times 10^{12}$ ohm meter respectively. Determine: **[6]**

i) Resistance of conductor &

ii) Insulation resistance of the cable for 150 m length.

c) Explain with neat sketch the construction and working of a lead acid battery and state it's any two applications. **[8]**

Total No. of Questions : 8]

SEAT No. :

**PD4028**

[Total No. of Pages : 4

# [6401]-1905

## First Year Engineering (All Branches)

## BASIC ELECTRICAL ENGINEERING

## (2019 Pattern) (Credit System) (Semester - I/II) (103004)

*Time : 2½ Hours]* *[Max. Marks : 70*

***Instructions to the candidates:***

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary.***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) For the Resonance in RLC Series circuit-Comment on reactance's, impedance, current & power factor. **[4]**

b) The R-L circuit when supplied by 180V, 50 Hz ac voltage, the voltage drop across the inductance is 150 V. The current drawn by the circuit is 5 A. Calculate: **[6]**

i) Inductive Reactance

ii) Inductance

iii) Resistance

iv) Impedance

v) Voltage across Resistance and

vi) P.F.

c) A voltage of V = V ∠0°V is applied across a R-L-C series circuit. Write the equation for impedance, current & comment on power factor --- when **[8]**

i) $X_L > X_C$

ii) $X_L < X_C$

Also draw the phasor diagram in each case.

OR

***P.T.O.***

***Q2)*** a) Define and state the unit of **[4]**

i) Admittance, susceptance,& conductance

ii) Impedance

b) If $v = V_m \sin(\omega t)$ is applied across single phase circuit and current flowing through the circuit is $i = I_m \sin\left(\omega t + \frac{\pi}{2}\right)$. Draw the circuit diagram & derive the expression for average power consumed in the circuit. **[6]**

c) A Pure resistance of 15Ω is connected in series with a pure inductor of 25mH. This series circuit is connected across 230V, 50-Hz supply. Find **[8]**

i) The Inductive Reactance

ii) Impedance

iii) Current

iv) Power factor

v) Phase angle

vi) Voltage across Resistor

vii) Voltage across inductor

viii) Draw the phasor diagram

***Q3)*** a) State the advantages of three phase systems over single phase system. **[3]**

b) Derive the EMF Equation of single-phase transformer. **[6]**

c) In a 3-phase Star-connected load, each phase has a an impedance of (50+j32) Ω. This load is fed from three phase supply voltage of 400 V with frequency of 50Hz. Calculate: **[8]**

i) Phase Voltage and Line Voltage;

ii) Phase Current and Line Current;

iii) Total Active Power, Reactive Power and Apparent Power consumed.

OR

***Q4)*** a) State the different types of losses in the transformer. **[3]**

b) A 80 KVA, 3200/400V, 50Hz, single phase transformer has 111 turns on the secondary winding. Calculate **[6]**

i) Number of turns on primary side

ii) Primary & Secondary full load current

iii) Cross sectional area of the core if the maximum flux density is 1.2T

c) Derive the relationship between the line current and phase current, line voltage and phase voltage, for a balanced three phase STAR connected load across three phase AC supply. Draw the circuit diagram & required phasor diagram. Assume phase sequence RYB and inductive load. **[8]**

***Q5)*** a) Compare the ideal & practical voltage source by means of **[4]**

i) definition

ii) Symbol & V-I characteristics.

b) Write the three steps to find current flowing through load resistance $R_L$ using Thevenins Theorem for the circuit shown in Figure-5 (b). **[6]**

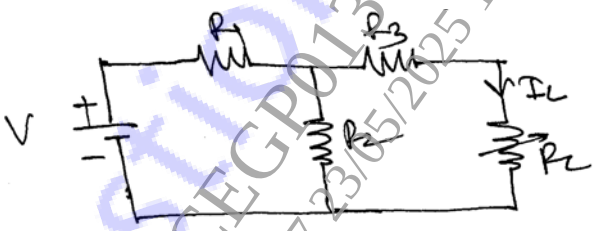


Figure-5 (b)

c) Derive the formulae to convert DELTA connected resistances into equivalent STAR connected resistances. Draw the circuit diagram in each case. **[8]**

OR

***Q6)*** a) State and Explain Kirchhoffs Laws. **[4]**

b) Find the Resistance between terminal A and C. **[6]**

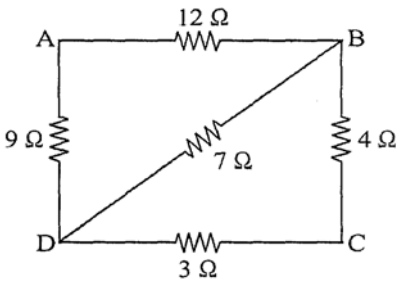


Figure-6 (b)

c) Find the current flowing through 5 Ω by applying Super Position Theorem. **[8]**

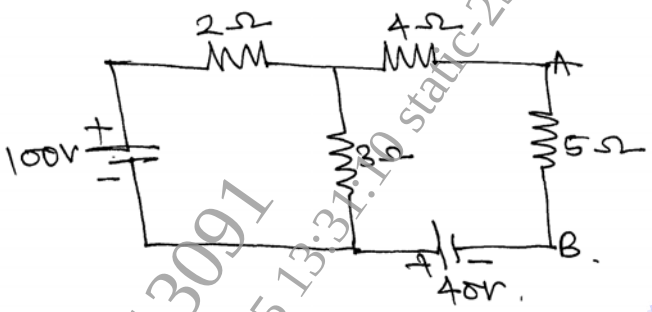


Figure 6 (c)

***Q7)*** a) Comment on effect of increase in temperature on Resistance of **[3]**

i) metallic conductor

ii) alloys &

iii) insulators

b) Explain the construction and working of Lead acid battery. **[6]**

c) Derive the expression of insulation resistance of the single core cable. Draw the cut section diagram & label it. **[8]**

OR

***Q8)*** a) State the 3 applications of lithium ion battery. **[3]**

b) With usual notations derive the expression **[6]**

$$\alpha_2 = \frac{\alpha_1}{1+\alpha_1(t_2 - t_1)}$$

c) Find the current flowing at the instant of switching 40 W, 240 V filament lamp. The temperature coefficient of resistance of filament is $5.5 \times 10^{-3}$ per degree Celsius at 20°C. The working temperature of lamp is 2000°C. Also find the working current & compare it with starting current. **[8]**

Total No. of Questions : 4]

SEAT No. :

**PE-524**

[Total No. of Pages : 2

# [6577]-5
## F.E. (All Branches) (Insem.)
## BASIC ELECTRICAL ENGINEERING
## (2019 Pattern) (Semester - I) (103004)

*Time : 1 Hour]* *[Max. Marks : 30*

***Instructions to the candidates :***

1) ***Solve Q1 or Q2; Q3 or Q4.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable additional data, if necessary,***
5) ***Use of non-programmable calculator is allowed.***

***Q1)*** a) Derive an expression for Energy stored per unit volume in the magnetic field. **[7]**

b) Two coils having turns 1000 and 1500 are placed on common magnetic circuit. A current of 5A in coil-1 produces a flux of 0.2mWb and 80% of this flux links to coil-2 . Find (i) Self Inductance of coil-1 (ii) Mutual Inductance between them.(iii) If this current in first coil is interrupted in o.olsec find self induced emf in coil-1 and mutually induced emf coil-2. **[8]**

OR

***Q2)*** a) Obtain an expression for coefficient of coupling between two magnetically coupled coils in terms of self inductances and mutual inductance. **[7]**

b) A coil of N turns is wound on a cast iron ring which has a mean length of 50 cm and its cross section is of 4 cm diameter. The current flowing through the coil is 2A. which produces flux of 6 mWb in the air gap of 2mm length. The relative Permeability of the iron is 1000. Calculate (i)Reluctance of Iron path (ii) Reluctance of Air gap (iii) Total Reluctance (iv) the number of turns N. **[8]**

***P.T.O.***

***Q3)*** a) Define the Average value and obtain the expression for Average value of sinusoidally varying alternating current in terms of its peak value. **[7]**

b) Three capacitors of 3 μF, 6 μF and 12 μF respectively are connected in series across a 350 V d.c. supply. Calculate: (i) Equivalent Capacitance (ii) the charge on each capacitor iii) the p.d. across each capacitor and (iv) the energy stored in the 6,μF capacitor. **[8]**

OR

***Q4)*** a) Derive an expressian for Energy stored in Capacitor. **[7]**

b) A sinusoidally varying alternating voltage of 1 00V,50Hz is applied to a circuit find **[8]**

i) the mathematical equation of the voltage

ii) Time Period

iii) The instantaneous voltage when t =0.3 ms

iv) The time taken by voltage to reach 85V first time after passing through zero.

v) Average value of the voltage

vi) Maximum value of the voltage.

◆ ◆ ◆