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 : 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. : ____

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]**

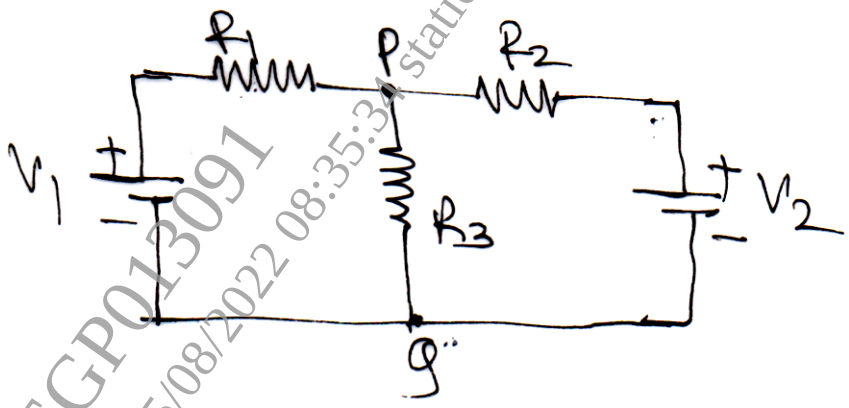

Figure 5c

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]**

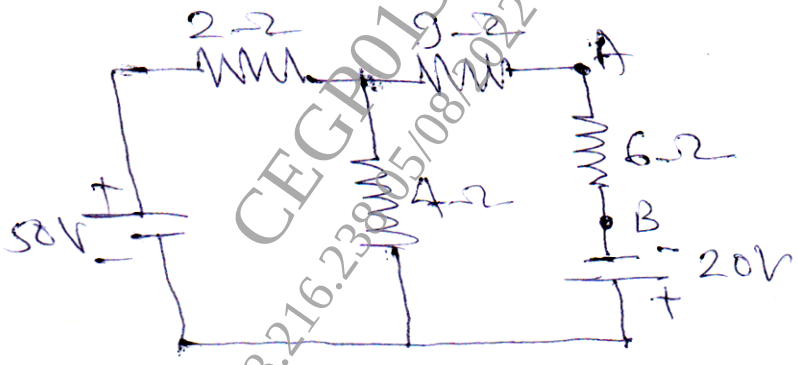

Figure 6b

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 α_1 and α_2 are the RTC of a conducting material at t_1^0C and t_2^0C 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 : 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]**

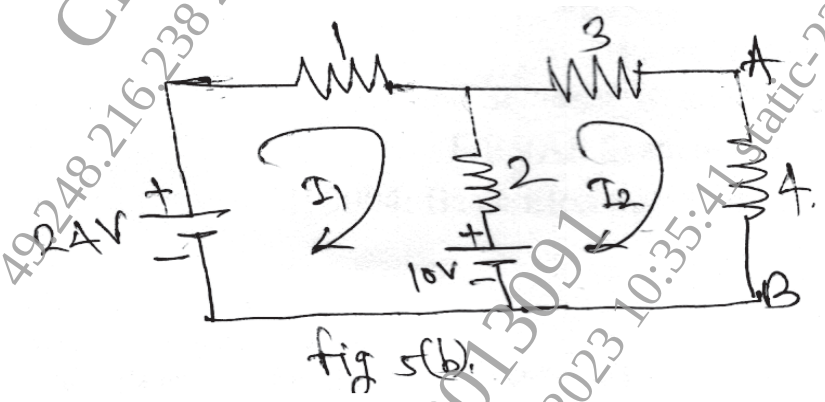

fig 5(b).

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]**

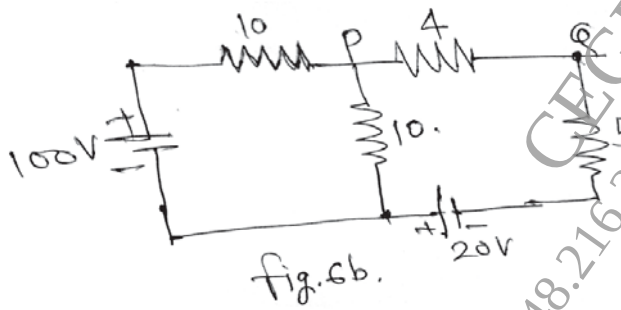

fig.6b.

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 α_1 and α_2 are the RTC of a conducting material at t_1^0C and t_2^0C respectively prove that $\alpha_2 = \frac{\alpha_1}{1+\alpha_1(t_2-t_1)}$ & hence, obtain $\alpha_t = \alpha_0 / (1+\alpha_0.t)$ **[8]**

Total No. of Questions—**8**] [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]

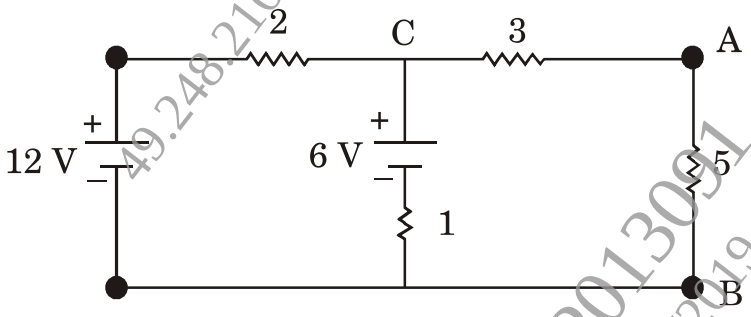

Fig. 5(*b*)

(*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. : [ ]

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.

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