[4161] – 104

Seat No.	

F.E. (Semester – I) Examination, 2012
BASIC ELECTRICAL ENGINEERING
(2008 Pattern)

Time : 3 Hours Max. Marks : 100

Instructions *:* 1) *Answer* ***3*** *questions from Section* ***I*** *and* ***3*** *questions from Section* ***II****.*

2) *Answers to the* ***two*** *Sections should be written in* ***separate*** *books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Black figures to the right indicate full marks.*

5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION – I

Q1. A) Field coil of a DC motor takes a current of 1.6 A from 400 V supply, after running for several hours. If temperature rise is 40°C, what value of extra resistance is required in the field circuit to maintain a field current equal to 1.6A ? Assume that motor is started from cold at 20°C and $\alpha_{20} = 0.0043 / ^{\circ} C$. **6**

B) Explain lead acid battery with respect to construction and maintenance. **6**

C) Explain following terms with respect to electrical. **4**

i) Energy ii) Power

OR

Q2. A) How long it takes to raise the temperature of 880 grm of water from 16°C to boiling point ? The heater takes 2A at 220V supply and has an efficiency of 90%. Assume the specific heat of water to be 4190 J/kgK and 1 liter of water to have a mass of 1 kg. **6**

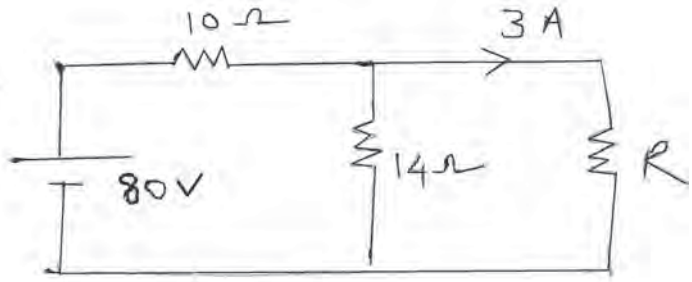
B) Derive expression for insulation resistance of a single core cable. **6**

C) Define temperature coefficient of resistance and state its unit. **4**

Q3. A) State and explain following laws. (i) KVL (ii) maximum power transfer theorem. **6**

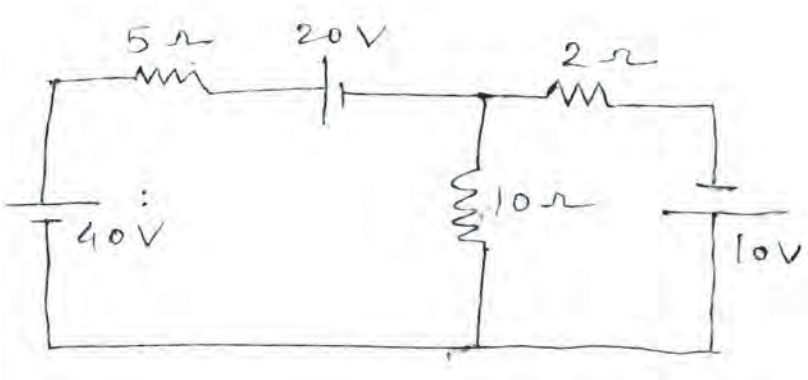
B) Derive an expression to convert star connected network in to its equivalent delta connected network. **6**

C) Find value of R using KCL and KVL. **4**



OR

Q4. A) Find current in 2-ohm resistance by using superposition theorem. **6**



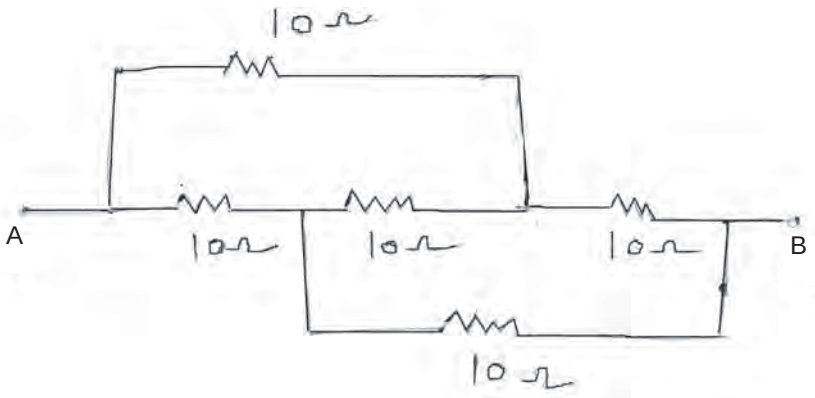
B) Explain following terms. **6**

i) Linear and non linear networks.

ii) Active and passive networks.

iii) Unilateral and bilateral networks.

C) Find equivalent resistance between A and B (All values in ohm). **4**



Q5. A) Define following terms and state its unit. **6**

i) Magnetic flux

ii) Flux density

iii) Permeability of free space.

B) A coil of 450 turns is uniformly wound around a ring of an iron alloy of mean circumference of 100 cm and cross sectional area 1.125 cm^2. When a current of 0.5A is linearly reduced to zero in 0.01 sec, the emf induced in coil is 2V. Find relative permeability of the iron alloy and the inductance of coil. **6**

C) Write any four applications of magnetic circuit and draw series magnetic circuit. **6**

OR

Q6. A) Compare electric and magnetic circuit. **6**

B) A magnetic circuit has the mean length of flux path of 20 cm and cross-sectional area of 1 cm^2. Relative permeability of its material is 2400. Find the mmf required to produce a flux density of 2 tesla in it. If an air gap of 1 mm is introduced in it, find the mmf required for the air gap as a fraction of the total mmf to maintain the same flux density. **6**

C) Derive the equation $L= N^2/S$ where L is self inductance of a coil, N is number of turns of coil and S is reluctance of magnetic circuit. **6**

SECTION – II

Q7. A) Two capacitors are connected in parallel having equivalent capacitance of $10\,\mu F$ while the same capacitors when connected in series have equivalent capacitance of $2\,\mu F$. Find the values of two capacitors. **6**

B) Define w.r.t. alternating quantities **4**

i) Form factor

ii) Crest factor

C) An alternating current is given by i = 14.14 sin 377t find (i) RMS value of current (ii) frequency (iii) Instantaneous value of current when t = 3 m sec (iv) time taken by current to reach 10 Amp for first time after passing through zero and increasing positively. **6**

OR

Q8. A) A $80\,\mu F$ capacitor in series with $1000\,\Omega$ resistor is connected suddenly across 110 V supply. Find

(i) Initial value of current

(ii) time constant of circuit

(iii) equation of current

(iv) value of current at t = 0.08 sec. **6**

B) Derive the expression for average value of an alternating current. **4**

C) Find the resultant of three voltages given by

$v_1 = 10 \sin \omega t$, $v_2 = 20 \sin \left(\omega t - \pi/4\right)$

$v_3 = 30 \cos \left(\omega t + \pi/6\right)$. **6**

Q9. A) A resistance of $25\,\Omega$, inductance of 64mH and capacitor of $80\,\mu F$ are connected in series across 110 V 50 Hz single phase a.c. supply. Calculate the current, voltage across individual element and overall power factor of the circuit. Draw neat phasor diagram taking current as reference axis and show all the voltage vectors. **10**

B) Define (i) admittance (ii) conductance (iii) susceptance of A.C. circuit. Express admittance in rectangular and polar form. Draw admittance triangle. State unit of admittance. **8**

OR

Q10. A) Two circuits A and B are connected in parallel across the supply of 230 V. The circuit A consists of resistance of 12Ω in series with inductive reactance of 5Ω. The circuit B consists of resistance of 8Ω in series with capacitive reactance of 4Ω calculate :

i) Total current drawn

ii) Power consumed by A

iii) Power consumed by B

iv) Total power consumed

v) Overall power factor of the circuit. **10**

B) Sketch the waveform of voltage, current and power if $v = V_m \sin \omega t$ volts is applied to a R-L series circuit. Also draw phasor diagram. State expression of power in this case. **8**

Q11. A) A 500 KVA transformer has iron losses of 2 kw and full load copper losses of 5 kw. Calculate **6**

1) Efficiency at 75% of full load, unity p.f.

2) Efficiency at full load 0.8 p.f. lag.

B) Differentiate core type and shell type transformer. **4**

C) Derive the relationship between the line current and phase current, line voltage and phase voltage for a balanced 3 phase star connected inductive load connected across 3 phase supply. **6**

OR

Q12. A) State and explain different losses taking place in the transformer. **6**

B) Derive the expression for emf induced in the transformer. **4**

C) Three inductive coils each with resistance of 15 Ω and inductance of 0.03H are connected in delta across 3 phase 400 V 50 Hz supply. Calculate line current and power consumed by the load. **6**

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