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Government College of Engineering, Amravati

(An Autonomous Institute of Government of Maharashtra)

Second Semester B. Tech. (All Branches)

Summer – 2017

Course Code: EEU201

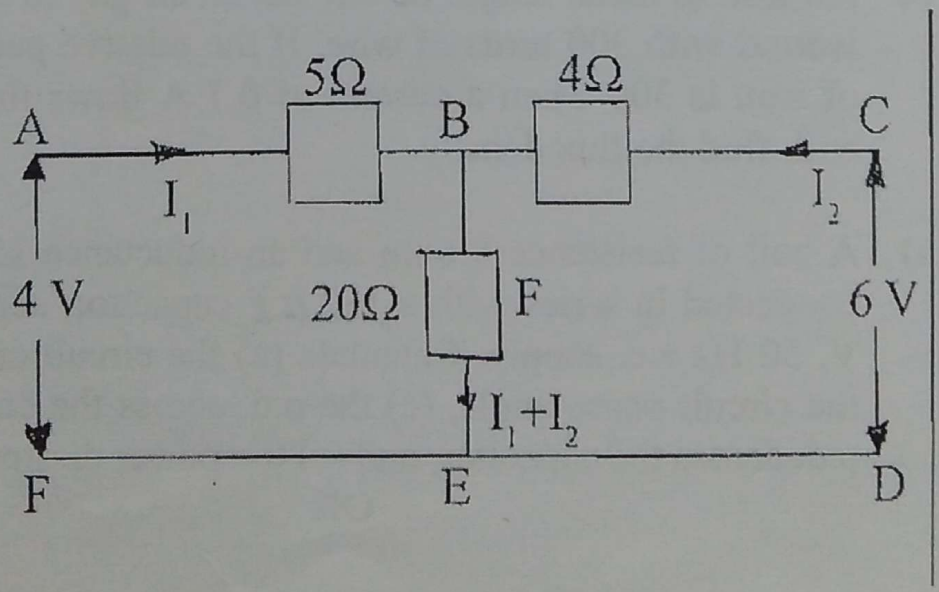
Course Name: Basic Electrical Engineering

Time: 2.00 hrs. **Max. Marks: 30**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state
3) the assumptions made.
4) Diagrams/sketches should be given wherever necessary.
5) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
6) Figures to the right indicate full marks.

1. a) Using Kirchhoff's laws, calculate the current flowing through each resistor as shown in figure. **4**



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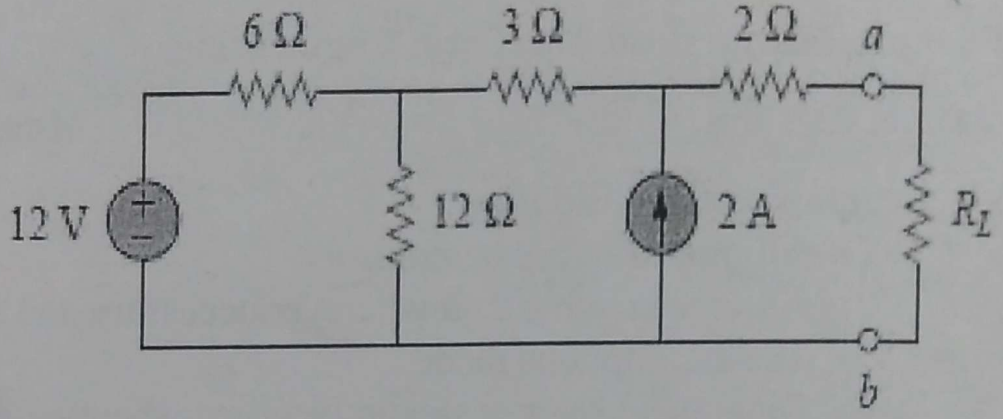
b) A resistor of 10 ohms is connected in series with two resistances each of 15 ohms arranged in parallel. What resistance must be shunted across this combination so that current taken shall be 1.5 amps, if 20V applied? 4

c) Find the value of R_L for maximum power transfer in the circuit of Fig. Find the Maximum power. 4



2 a) Derive the expression for energy stored in a magnetic field. 4

OR

Compare electric and magnetic circuits with respect to their similarities and dissimilarities. 4

b) An iron of mean length 60 cm has an air gap of 2mm. It is wound with 300 turns of wire. If the relative permeability of iron is 300 when a current of 0.7 A flows through the coil, find the flux density. 5

3 a) A coil of resistance 8 ohm and an inductance 150 mH, is connected in series with a 100 μ F capacitor, across a 240 V, 50 Hz a.c. supply. Calculate (a) the circuit current, (b) the circuit phase angle, (c) the p.d. across the coil, (d) the p.d. across the capacitor, and (e) the power dissipated. 5

OR

Derive the relationship between line voltage and phase voltage, and line current and phase current for a balanced star connected load. **5**

b) A capacitor of 100 μF is connected across a 200V, 50Hz single phase supply. Calculate (i) the reactance of the capacitor (ii) rms value of current and (iii) the maximum current. **4**

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Instructions to Candidate

1) All questions are compulsory.
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5) Figures to the right indicate full marks.

Choose the correct answer for the questions given below: **3**

a) Under the condition of resonance, RLC series circuit behaves as a
i) purely resistive circuit ii) inductive circuit
iii) capacitive circuit iv) purely inductive circuit

b) In a star connected balanced circuit, the phase difference between the line voltage V_{RY} and the phase voltage V_{RN} is equal to,
i) 60^0 ii) 30^0 iii) 120^0 iv) $30 - \varphi$

c) If 100 V is applied across a 200 V, 100 W bulb, the power consumed will be
i) 100 W ii) 50 W iii) 25 W iv) 12.5 W

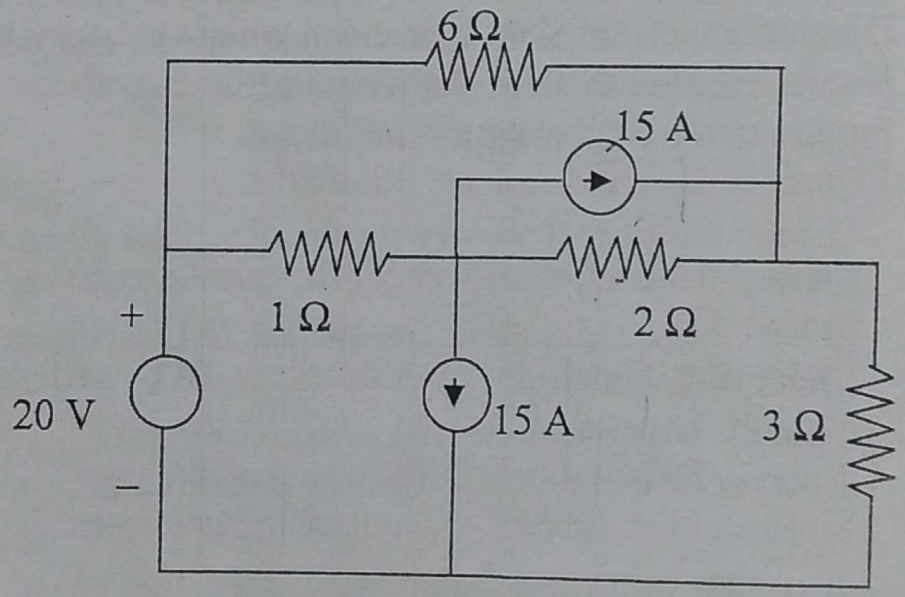
Contd..

d) The rms value of a sine wave of maximum value 10 A equals a dc current of .....Ampere.
i) 7.07 ii) 6.37 iii) 5 iv) 5.77

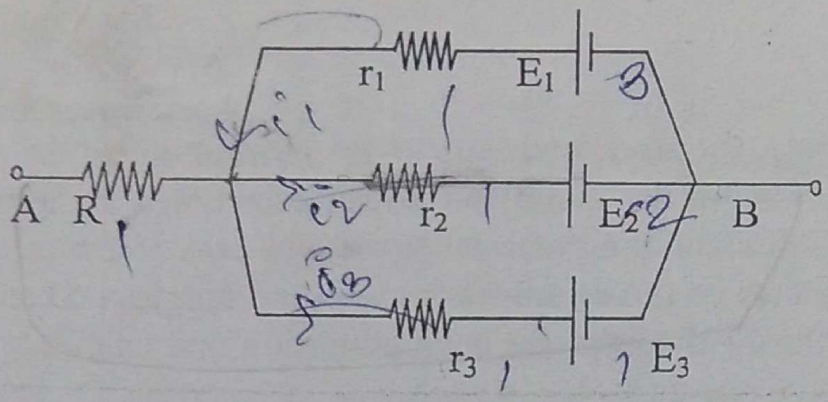
e) The ability of a magnetic material to retain its magnetism even after the magnetizing force is removed is called its
i) residual magnetism ii) retentivity
iii) coercivity iv) permeance

f) The unit(s) of inductance is(are)
i) Henry ii) Vs/A
iii) Wb-turn/A iv) all of the above

2 a) Determine the voltage across 3 Ω resistor for the circuit shown in following figure using Thevenin's theorem. **5**



b) In the circuit shown in fig. $E_1 = 3$ V, $E_2 = 2$ V, $E_3 = 1$ V, $R = r_1 = r_2 = r_3 = 1$ Ω. **4**
i) Find the potential difference between points A and B, and the current through each branch.
ii) If r_2 is short–circuited and the point A is connected to the point B, find the current through E_1, E_2 and E_3, and the resistance R.



3 a) A steel ring of circular section of 1 cm in radius and having a mean circumference of 94.3 cm and air gap of 1 mm long. It is uniformly wound with an exciting coil consisting of 600 turns and excited with a current of 2.5 Amp. Neglecting magnetic leakage, calculate: **5**

i) MMF ii) magnetic flux iii) reluctance
iv) flux density v) relative permeability of steel.
Assume that steel part takes about 40 % of total Ampere-turns.

b) Explain the concept of mutual inductance. Define coefficient of coupling and derive the expression between self inductances of two coils, mutual inductance between them and the coefficient of coupling. **4**

OR

c) Explain the following terms: **4**
i) Magnetic Potential ii) Magnetic field strength
iii) Reluctivity iv) Relative permeability

a) Derive relationship between line & phase values of voltage & current in balanced three phase DELTA connection. **4**

Contd

b) A coil is in series with a 20 μF capacitor across a 230 V, 50 Hz supply. The current taken by the circuit is 8 A and the power consumed is 200 W. Calculate the inductance of the coil if the power factor of the circuit is leading and lagging. Sketch a phasor diagram for each condition and calculate the coil power factor in each case. 5

OR

c) An inductve coil of resistance 15 Ω and inductive reactance 42 Ω is connected in parallel with a capacitive reactance of 47.6 Ω. The combination is energized from a 200 V, 33.5 Hz ac supply. Find the total current drawn by the circuit and its power factor. Draw to the scale the phasor diagram of the circuit. 5

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Second Semester B. Tech.

Summer – 2014

Course Code: EEU201

Course Name: Basic Electrical Engineering

Time: 2 Hrs. **Max. Marks: 30**

Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
3) Use of non-programmable calculators is permitted.
4) Figures to the right indicate full marks.

1 **Attempt any three –**

(a) Compare the diameter of an aluminium conductor with that of a copper conductor for the same length and same resistance of conductors. The resistivity of aluminium is 0.0284 μΩm and that of copper is 0.0178 μΩm. **06**

(b) For the network shown in figure Q. 1 (b), find the value of current through 1.2 Ω resistance using Thevenin's theorem. **06**

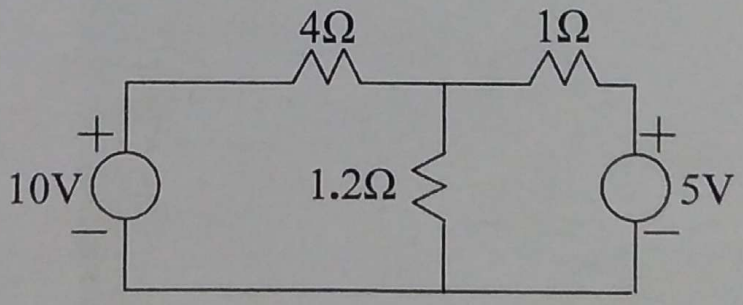

Fig. Q 1 (b)

Contd...

(c) Two identical 750 turn coils A and B lie in parallel planes. A current changing at the rate of 1500 A/s in A induces an emf of 11.25 V in B. Calculate the mutual inductance of the arrangement. If the self inductance of each coil is 15 mH, calculate the flux produced in coil A per ampere and the percentage of this flux which links with B **06**

(d) Compare an electric circuit and a magnetic circuit. **06**

2 (a) Three impedances Z_1, Z_2 and Z_3 are connected in series across a 200 V, 50 Hz supply. If $Z_1 = 20\ \Omega$, $Z_2 = (8 + j10)\ \Omega$, $Z_3 = (15 - j15)\ \Omega$, determine **06**
(i) the current through the circuit
(ii) the power factor of the circuit
(iii) the voltage across each impedance

(b) A three-phase star connected load consists of three similar inductive coils, each of resistance 50 Ω and inductance 0.3 H. The supply is 415 V, 50 Hz. Calculate – **06**
(i) the line current,
(ii) the power factor, and
(iii) the total power

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Second Semester B. Tech.

Summer – 2013

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Instructions to Candidate

1) All questions are compulsory.
2) Assume suitable data wherever necessary and clearly state the assumptions made.
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4) Use of logarithmic table, drawing instruments and non-programmable calculators is permitted.
5) Figures to the right indicate full marks.

1. Choose the correct answer for the questions given below 3

a) In an R-L-C parallel circuit, the impedance at resonance
   i) minimum ii) maximum
   iii) infinity iv) zero

b) The power taken by a 3-φ load is given by the expression
   i) $3 V_L I_L \cos \varphi$ ii) $\sqrt{3} V_L I_L \cos \varphi$
   iii) $3 V_L I_L \sin \varphi$ iv) $\sqrt{3} V_L I_L \sin \varphi$

(b) 1

$\cos \theta = 1$ 0

$\theta =$

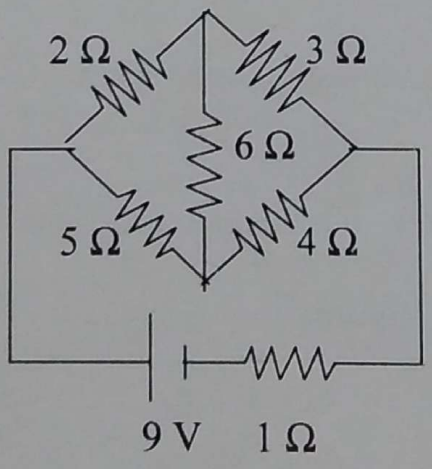
c) An air gap is usually inserted in a magnetic circuit to
i) prevent saturation ii) increase the flux
iii) increase the mmf iv) decrease the flux 3

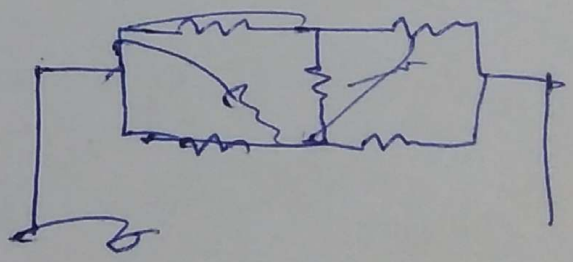
d) The coupling between two magnetically coupled coils is said to be ideal if the coefficient of coupling is
i) 0 ii) 0.25 iii) 0.5 iv) 1

e) An R-L-C series circuit is connected across a sinusoidal source. If the voltage across R, L and C is 3 V, 14 V and 10 V respectively then input voltage is .....V.
i) 10 ii) 5 iii) 27 iv) 24

f) Permeability is expressed in
i) H/m^3 ii) H iii) H/m iv) H/m^2

2 a) Calculate the current in 6 Ω resistor in Fig. given below using Norton's Theorem. 5 4





b) Two coils connected in series have resistances of 600 Ω and 300 Ω, and temperature coefficients of 0.1 % and 0.4 % per °C at 20 °C respectively. Find the resistance of combination at a temperature of 50 °C. What is the effective temperature 4

coefficient of the combination at 50 °C?

3 a) A steel ring of 25 cm mean diameter and circular section 3 cm in diameter has an air gap of 1.5 mm length. It is wound uniformly with 700 turns of wire carrying a current of 2 A. Calculate **5**
i) magnetomotive force, ii) flux density,
iii) magnetic flux, iv) reluctance,
v) relative permeability of steel ring.
Neglect magnetic leakage and assume that iron path takes about 35 % of the total magnetomotive force.

b) Derive the expression for energy stored in a magnetic field and energy stored per unit volume. **4**

OR

c) Compare electric and magnetic circuits with respect to their similarities and dissimilarities. **4**

4 a) A choke coil is connected across a variable frequency ac supply, the voltage of which is kept constant at 220 V. When the frequency of the supply is 50 Hz, an ammeter in the circuit reads 60 A. On increasing the frequency to 100 Hz, the current indicated by the same ammeter falls to 40 A, calculate the resistance and inductance of the coil. **5**

OR

b) A balanced 3-phase star connected load of 100 kW takes a leading current of 80 A, when connected across a 3-phase, 1100 V, 50 Hz supply. Find the circuit constants of the load per phase. **5**

c) Derive the relationship between line voltage and phase voltage, and line current and phase current for a balanced star connected load. **4**