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10116

Reg. No. _____ Name _____

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2016

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

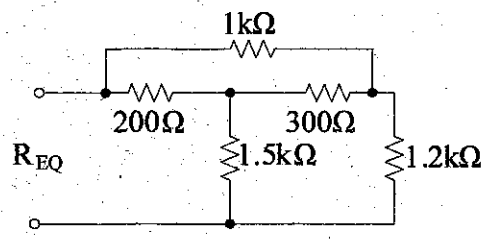
Instructions: Make suitable assumptions if any data is missing
Write units in all numerical answers

PART- A

Answer all Questions. 10x4 = 40 marks

1 Draw and explain the characteristics of ideal and practical voltage and current sources.

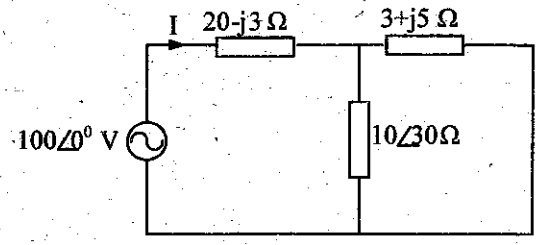
2 Using star-delta transformations, find the total resistance R_{EQ} for the circuit shown below.



3 What is fringing effect and leakage flux in magnetic circuit? What are its disadvantages?

4 An alternating current is represented by $i(t) = 200\sin(314t)$. Find (i) RMS value (ii) frequency (iii) time period and (iv) instantaneous value of voltage when $t = 3$msec.

5 From the figure shown below, (i) evaluate current 'I' flowing through the circuit and (ii) draw the phasor diagram of current and voltage (take source voltage as reference quantity).



6 A choke coil takes 3A which is lagging 60^0 with respect to applied voltage of 230 V, 50 Hz AC supply. Determine impedance, resistance and inductance of coil.

7 List a few advantages of three phase system over single phase system.

8 Three impedances $(10+j15)$ Ω are connected in delta across three phase 400 V supply. Find the line current, power factor and active power.

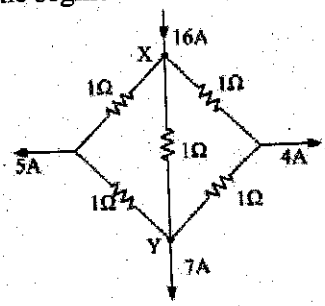
9 Explain the necessity of earthlings in electrical installations

10 Draw a schematic layout of LT switch board.

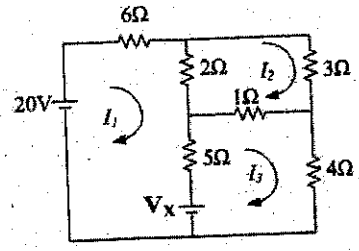
PART- B

Answer any four full Questions 4x10 =40 marks

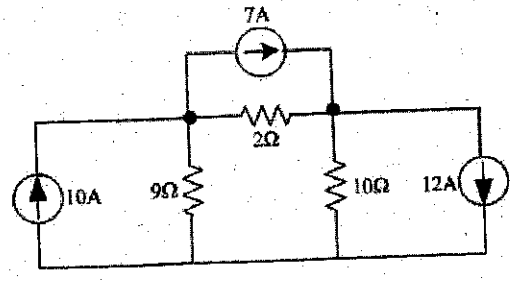
11 a. Compute current through the segment *X* and *Y* shown in the figure below. (4)



b. Determine unknown voltage V_X given in the figure, so that the current supplied by the 20V source is zero (6)

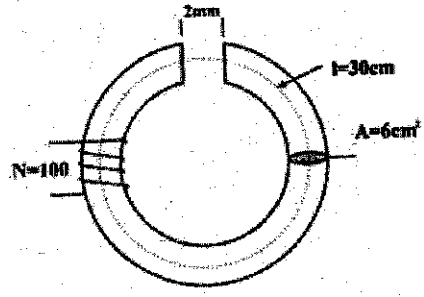


12 a. Using nodal analysis, find power consumption of 10 Ω resistor in the circuit given below (7)



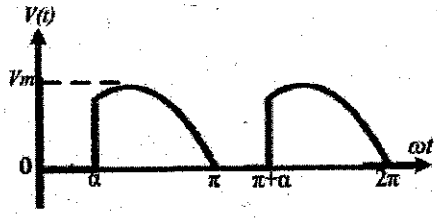
b. What are the dissimilarities of electric and magnetic circuits? (3)

13 a. An iron ring of cross sectional area 6 cm^2 is wound with a wire of 100 turns and the ring has a saw cut of 2 mm shown below. Calculate the magnetizing current required to produce a flux of 0.1 mWb if mean length of magnetic path is 30 cm and relative permeability of iron is 470.Neglect magnetic leakages and fringing. (6)



b. Derive the expression of coefficient of coupling in terms of mutual inductance and self-inductance. (4)

14 a. The output voltage appearing across an electronic power converter is shown in figure. Find RMS and average value of $v(t)$ if $Vm = 100$ V and $\alpha = 60^{\circ}$ (6)



b. Explain how sinusoidal voltages and current are represented in phasor form (4)

15 a. Express the phasor in time domain '$i(t)$' after carrying required computation in phasor form $I = \frac{(4e^{-j\pi/12} - 3e^{j\pi/8})}{(2\angle -25)(2-j2)}(15+j1.2)$ (5)

b. Sketch how the parameters of a series RLC circuit vary with frequency. Define 'Q' Factor and bandwidth of a series resonant circuit? (5)

16 a. Prove the instantaneous power consumed by a pure inductor is zero. (3)

b. A series RLC circuit with L= 25 mH and C = 70 μF has a lagging phase angle 30^0 at f =320 Hz. At what frequency will the phase angle be 40^0 leading (7)

PART- C

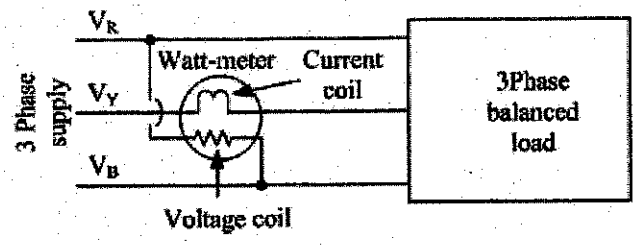
Answer two full Questions (17 or18 and 19 or 20)

17 a. The Power input and line current of three phase induction motor is 15 kW and 25A respectively. Find the readings of two watt meters connected to measure the motor input power. Assume three phase supply voltage is 400V (6)

b. Explain phase sequence of three phase system. (4)

OR

18 a. Figure below shows a watt meter connection in a three phase balanced load is connected to balanced three phase supply. Prove that wattmeter reading is proportional to reactive power consumed by the load. (6)



b. Derive the line and phase voltage relationship in a star connected three phase circuit with the help of phasor diagram. (4)

19 With neat sketch, explain the method of standard pipe earthing. (10)

OR

20 Explain briefly, various protective devices used in LT installations (10)

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JUNE 2016

BE101-03 INTRODUCTION TO ELECTRICAL ENGINEERING

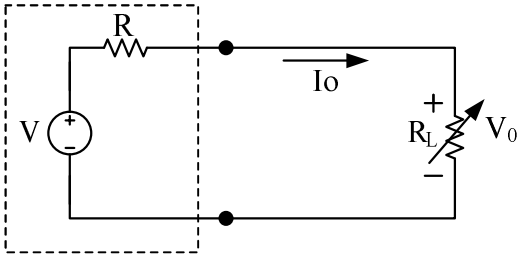
Max. Marks: 100 Duration: 3 Hours

Instructions: Make suitable assumptions if any data is missing
Write units in all numerical answers

PART- A

(Answer all Questions. 10x4 = 40 marks)

1 Identify and explain the source given in the figure below within the dotted line. Given V=1.5V and R=1Ω, find the value of current I_0 and voltage V_0 across R_L for the following values of R_L = 0.1, 0.5 and 1.0 Ω. (4)



2 List a few similarities and dissimilarities of magnetic and electric circuits. (4)

3 A 50 cm long conductor moves with a velocity of 2 m/s at right angles to itself and a uniform magnetic field of 1Wb/m^2 flux density. Calculate the voltage induced between the ends of the conductor. What will be the voltage if the conductor is moving at 30^o from the direction of the flux? (4)

4 A capacitor of capacitance 79.5 μF is connected in series with a non-inductive resistance of 30 Ω across 100 V, 50 Hz supply. Find (i) impedance (ii) current (iii) phase angle and (iv) equation for instantaneous value of current. (4)

5 The voltage across 150 Ω resistor is 150 $\sin(2\pi\times10^3 t)$ V. At what value of '*t*' does the current through the resistor equal to -0.26 A and what is instantaneous power at this time *t* ? (4)

6 What is resonant frequency? Give a graphical explanation of series resonance in series RLC circuits. (4)

7 What are the advantages of three phase system over single phase system? (4)

8 How do you measure 3phase reactive power in a balanced 3 phase system using one Wattmeter? (4)

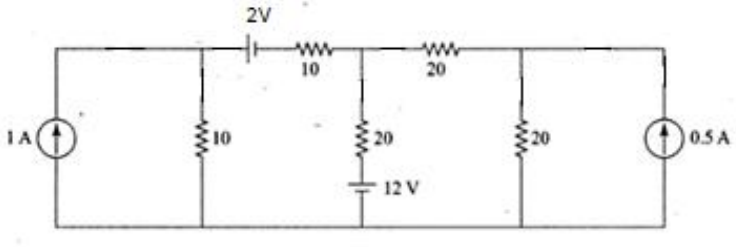
9 What is the role of a MCB in domestic wiring circuit? Also explain the working of MCB (4)

10 Explain the necessity of earthing in electrical appliances (4)

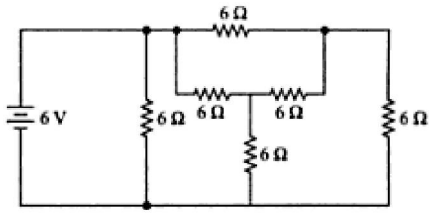
PART- B

Answer any four full Questions

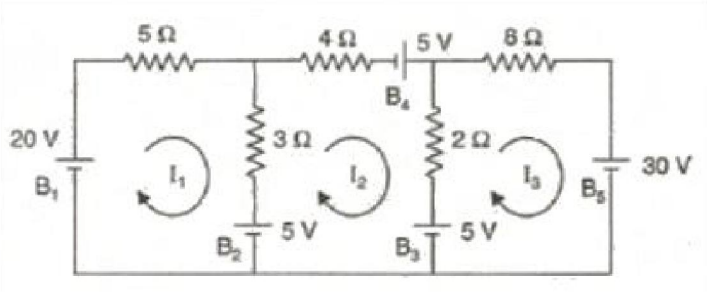
11 a. Using Nodal Analysis find the currents flowing through the various branches in the circuit shown in figure below. (6)



b. Calculate the current supplied by the battery in the circuit shown in figure below (4)

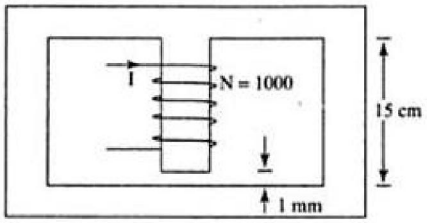


12 a. Using mesh analysis, determine the current supplied by each battery in the circuit shown in figure. (6)

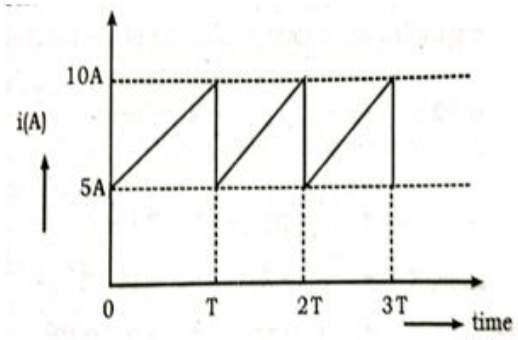


b. Drive the expression for coefficient of coupling (K) between two magnetically coupled circuits. (4)

13 Calculate the current required to be passed through the central limb winding so as to produce a flux of 1.6 mWb in this limb. Length of iron in the central limb is 15 cm. Cross sectional area of the central limb is 8 cm^2 and that of outer limbs 4 cm^2. The mean length of iron of the outer limb is 32 cm each. Given that for iron, for a flux density of 2.0 Wb/m^2, the value of H is 800 AT/m. (10)



14 Find the average value and r.m.s value of the waveform given below. (10)



15 a. Explain how sinusoidal voltages and currents are represented as phasor? (4)

b. A Coil of resistance 50 Ω and inductance 100 mH is connected in series with a capacitor of 500 μF is connected across a 230 V, 50 Hz ac supply. Find (i) Current through the coil (ii) Power consumed (iii) Reactive power and (iv) Voltage across the coil. Also draw the phasor diagram with voltage as the reference vector. (6)

16 a. Prove the instantaneous power consumed by a pure capacitor is zero. (4)

b. A series LCR circuit which resonates at frequency 500 kHz has L=100 μH, R=25Ω and C=1000 pF. Determine (i) the Q-factor of the circuit (ii) the new value of C required to resonate at 500 kHz when the value of L is doubled and the new Q factor. (6)

PART- C

***Answer two full Questions* (*17 or 18 and 19 or 20*)**

17 a. Derive the relation between Line and Phase Values of Voltage and Current for a delta connected system. (4)

b. The load to a three phase power supply consists of three similar coils connected in star. The line currents are 25A and the kVA and kW inputs are 20 and 11 respectively. Find (i) the phase and line voltages (ii) the reactive power input (iii) the resistance and reactance of each coil. (6)

OR

18 a. What is meant by phase sequence of a 3 phase system? (3)

b. Three identical coil having resistance of 10 Ω and an inductance 38.2 mH are connected in delta across 400 V, 3 phase 50 Hz supply. Find wattmeter reading if two Wattmeter method is used to measure total power. (7)

19 With a neat sketch explain plate earthing indicating standard dimensions. (10)

OR

20 a. If an earth leakage is occurred in a domestic installation, which protective device will act? Explain the working of that device. (5)

b. Give the schematic Layout of an LT Switch Board. (5)

Reg. No._____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JANUARY 2017

Course Code**: BE101-03**

Course Name**: INTRODUCTION TO ELECTRICAL ENGINEERING**

Max. Marks: 100 Duration: 3 Hours

PART A

Answer All Questions. 4 Marks each

1. Distinguish between statically induced EMF and dynamically induced EMF. List few electric equipments working on these principles.
2. Draw the V-I characteristics of ideal and practical voltage and current sources.
3. Find current through 20kΩ resistor in the circuit shown below using Kirchhoff's Law.

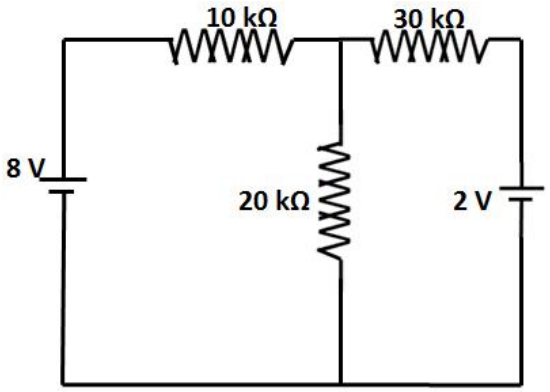


Fig-1

4. Draw the circuit of a series parallel magnetic circuit. Show its electrical equivalent.
5. Why RMS value is used instead of average value for an alternating quantity? Show that for sinusoidal voltage, RMS value is 0.707 times its maximum value.
6. A pure inductance of 318 mH is connected in series with a pure resistance of 75Ω. This circuit is supplied from a 50Hz sinusoidal source and voltage across the 75Ω resistance is found to be 150V. Calculate the supply voltage.
7. Define (a) active power, (b) reactive power, (c) apparent power and (d) power factor in an ac circuit.
8. An RLC circuit connected to a variable frequency voltage source is shown below (Fig 2). What will be the value of impedance at resonance, current through the circuit at resonance and resonance frequency of the circuit?

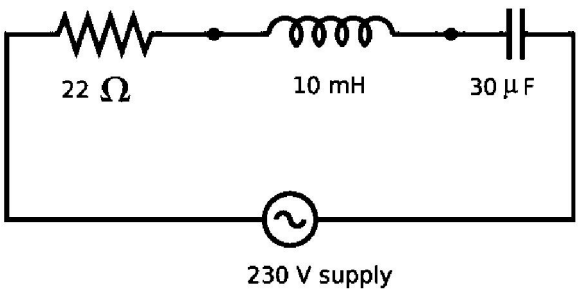


Fig-2

9. What are the advantages of three phase power generation?
10. Derive the Line and Phase voltage relationship in a star connected three phase circuit with the help of Phasor diagram.

PART B

Answer any four full questions

11. (a) Define (a) self inductance (b) mutual inductance and write the expression of coefficient of coupling. **(6)**
    (b) Derive the expression for energy stored in inductance. **(4)**
12. (a)State Kirchhoff's first law and second law. These laws express the conservation of two important physical quantities. Name the quantities. **(3)**
    (b) Find the voltage between A and B of the circuit shown in **Fig-3** using Mesh analysis. **(7)**

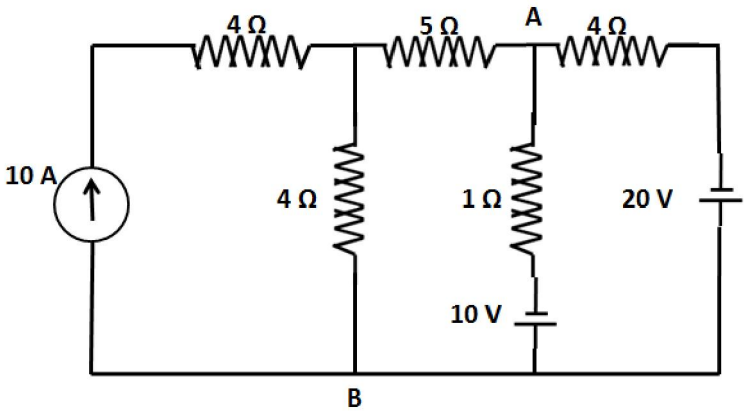


Fig-3

13. a) Find the current through the 20 Ω resistor shown in the **Fig-4** by using nodal analysis. **(6)**

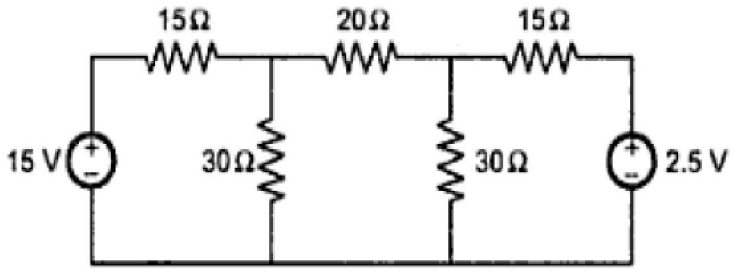


Fig-4

(b) In the network shown determine the equivalent resistance between the terminals A and B. **(4)**

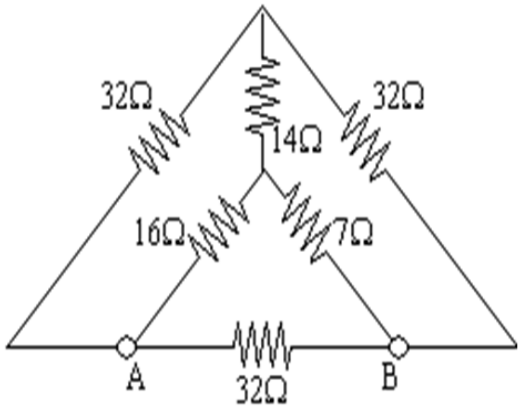


Fig-5

14. a) Compare electric and magnetic circuits **(3)**

(b) A mild steel ring of 30 cm mean circumference has cross sectional area of 6cm^2 and has winding of 500 turns on it. The ring is cut to provide an air -gap of 1mm in the magnetic circuit. It is found that a current of 4A in the winding produces a flux density of 1Tesla in the air gap. Find the following **(7)**

I. Relative permeability of mild steel
II. Inductance of the winding

15. A full wave rectified sine function is clipped at 0.707 of its maximum value as shown in **fig-6**. Find the average and rms values of the function.

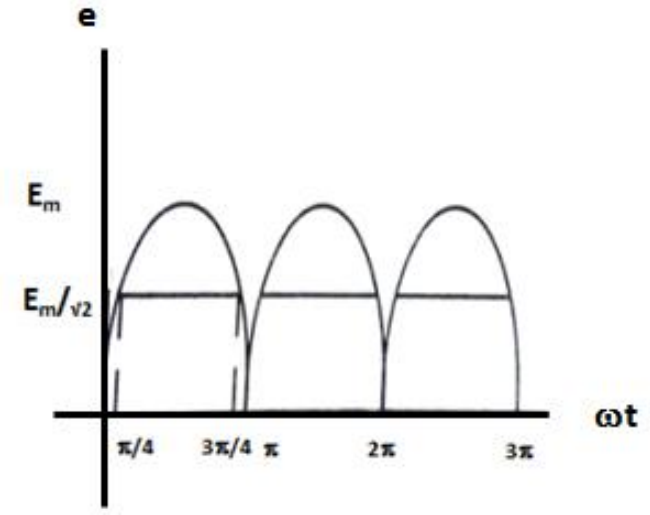


Fig-6

16**.** a) A current of 5A flows through a non-inductive resistance in series with a choke coil when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and across the coil is 200V, calculate the following.

i. Impedance, reactance and resistance of coil **(3)**
ii. Power absorbed by the coil **(2)**
iii. Total Power **(1)**

(b) Prove that the power consumed in a purely capacitive circuit is zero **(4)**

PART-C

Answer Two full questions 17or 18 and 19or 20

17. (a) Two impedances (10 + j5Ω) and (25-j10Ω) are connected in parallel across 100V, 50Hz supply. Find the total current, branch currents, power factor and power consumed. **(6)**

(b)The apparent power drawn by an AC circuit is 10KVA and active power is 8KW. What is the reactive power and power factor of the circuit? **(4)**

18. (a) Sketch the variation of impedance in series resonance circuit **(2)**

(b) An RLC series circuit has R=10Ω, L=0.1H, C=8μF Calculate the following

i. Resonant frequency **(2)**
ii. Q- factor of the circuit at resonance **(2)**
iii. Half power frequencies and band width **(4)**

19. Two single phase wattmeter are used to measure three phase power. The readings of the two wattmeterare 2000W and 400W respectively. Calculate the following

i. Power factor of the circuit. **(6)**
ii. What would be the power factor if the reading of the second wattmeter is negative? **(4)**

20. (a) Derive the expression for power and power factor in a balanced three phase system using two wattmeter method. **(6)**

(b) A star connected balanced load with per phase impedance of (8+j6) Ω is shown in figure. **(4)**

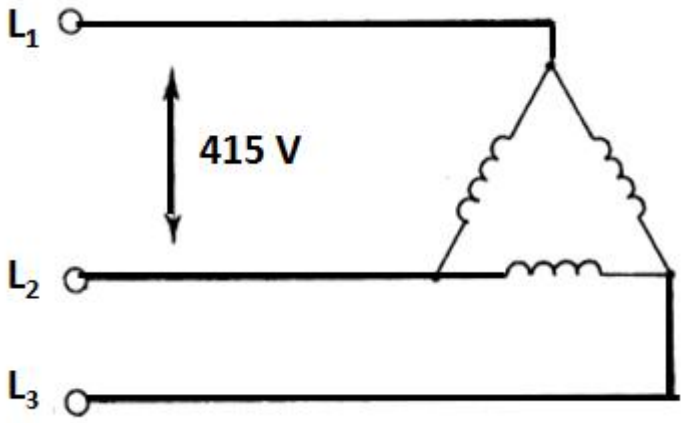


Fig-7

i. What is the value of per phase voltage?
ii. What will be the per phase current?
iii. What will be the line current?

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

BE101-03: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 hrs

Instructions:

Make suitable assumptions and approximations if any data is missing.
Numerical accuracy may be rounded to two decimal places in the final values.
Write units in all numerical answers.

PART A

Answer ALL questions. Each question carries 4 marks.

1. The terminal i-v characteristics of a practical current source is given in Figure 1. Evaluate the internal resistance parallel to the source. What is the value of resistance to be connected at the output terminals if the output voltage is 4V?

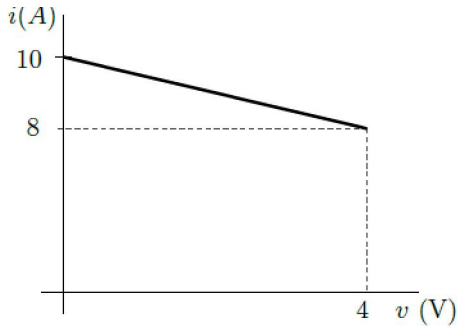

Figure 1: i-v characteristics of a current source

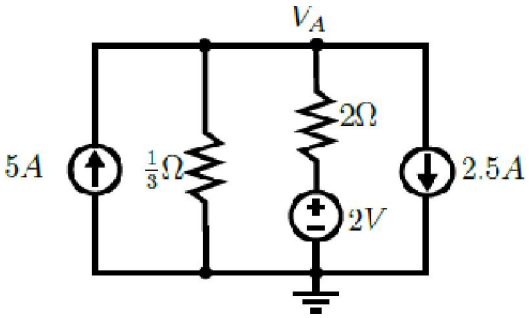

Figure 2: A dc network

2. In Figure 2, use node voltage analysis to find the node voltage VA.
3. Write four differences between electric and magnetic circuits.
4. RMS value is “Root of the Mean of the Squares." Find the rms value of the stepped waveform shown in Figure 3. (To save time, it is suggested to avoid integration).

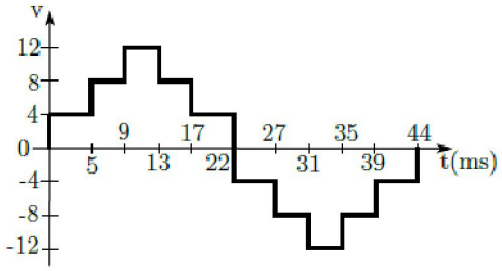

Figure 3: A stepped waveform

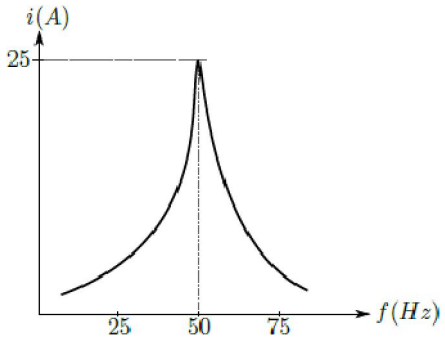

Figure 4: Resonance in a series RLC circuit

5. An R-L series circuit is supplied from an ac voltage source *v(t) = 12 cos 4t* V. The complex power delivered by the source is S = 3.6+j7.2 VA. Calculate the values of the resistance, R, and the inductance, L. Evaluate the power factor.
6. The variation of current against frequency in a series R-L-C circuit is shown in Figure 4. From the figure, obtain the resonant frequency of the circuit. If at resonance, the total voltage across the RLC series circuit is 100V, evaluate the resistance in the circuit. What is the power factor at resonance? Calculate the power dissipated in the RLC circuit at resonance. The voltage, current etc are expressed in rms values.
7. Define `power factor' in ac circuits. What is its value for (a) pure resistive circuit, (b) pure inductive and (c) pure capacitive circuits?
8. A three-phase four-wire system has a balanced load in Y-connection. The phase impedance of the load is Zph = 10∟30 Ω. If the line-to-line voltage is V_{ll} = 400 V rms, evaluate the phase currents in polar form. Evaluate the total active power.
9. Draw the circuit diagram for measuring power in a three-phase three-wire system using two wattmeter method, showing clearly the three-phase sources, the two wattmeters and the three-phase loads connected in star connection. Can this method of power measurement be used for measuring power with unbalanced three-phase loads?
10. A three-phase (ABC system assumed) delta connected balanced load is drawing a current of 10∟- 30° in the AB arm of the delta. If the A- phase voltage is 230∟0°, draw the phasor diagram showing all the three phase-currents, three line-currents and three phase- voltages. Lengths of voltages/currents may be shown at convenient scales. All angles have to be indicated.

PART B

Answer ANY FOUR full questions. Each full question carries 10 marks.

11. (a) State Faraday's laws of electromagnetic induction. Express its mathematical form. (4)

    (b) Write the terminal v-i relationship for an inductor, L. The current through an inductance 100 mH is shown in Figure 5. Draw the waveform of voltage across the inductor for the given time duration. Calculate the peak energy stored in the inductor.

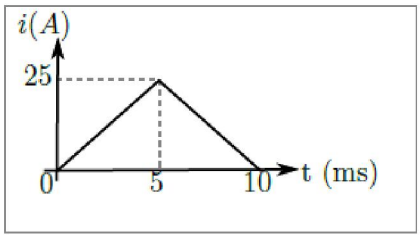

Figure 5: Current in an inductor

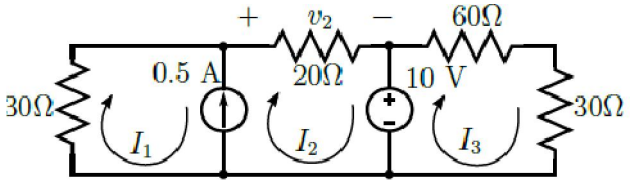

Figure 6: Mesh analysis with current source

12. (a) In Figure 6, find v2, I1, I2, and I3 using mesh analysis. Also evaluate the power delivered by the current source.

    (b) Derive the expression for delta equivalent resistors from a star network. (4)
13. (a) A magnetic circuit consists of a cast steel yoke which has a cross-sectional area of 200 mm^2 and a mean length of 120 mm. There are two air gaps, each 0.2 mm long. Calculate: (i)

the m.m.f. required to produce a flux of 0.05 mWb in the airgaps; (ii) the value of the relative permeability of cast steel at this flux density. The magnetization curve for cast steel is given by the following (values not present in the table may be approximated as average of the adjacent values):

B(T)	0.1	0.2	0.3	0.4
H (A/m)	170	300	380	460

(b) State whether the following statements are TRUE or FALSE:

i) In magnetic circuits, flux "flows" like electric current in electric circuits.
ii) For a steady flux in a magnetic core, there will not be any magnetic loss.
iii) In reality, the flux density in an air-gap is not the same as that in the magnetic core.
iv) The slope of B-H curve of a ferromagnetic material such as iron is a constant.

14. (a) Two impedances, $10\angle -30°$ and $20\angle 60°$ are connected in parallel. Evaluate the equivalent impedance. What is the nature (capacitive or inductive) of the equivalent impedance? If a current of $10\angle 45°$ is passing through the parallel combination, calculate the voltage across the combination and express it in rectangular form. Evaluate the currents in each of the impedances. Draw the phasor diagram showing this voltage and all the three currents.

(b) Define peak factor and form-factor. Consider *v(t) = 500 cos(100t)*, a sinusoidal voltage. Evaluate the rms value and peak factor of the voltage waveform.

15. Figure 7 shows a torroid with a mean diameter 95 mm. The cross-section is circular and its diameter is 10 mm. One side of the ring carries 400 turns. The torroid has an air-gap of 0.5 mm on its right half as shown in the figure. It is required to have a flux of 0.44 mWb in the air-gap. The magnetic material of the torroid has a flux density of 1.4T at H=1200 AT/m. Neglect fringing of flux lines.

(a) Draw an equivalent circuit for the magnetic circuit. (2)

(b) Evaluate the reluctances of the magnetic circuit (ABCD) and that of the air-gap. Evaluate the total reluctance seen by the mmf source.

(c) Calculate the current required by the winding for establishing the flux. (2)

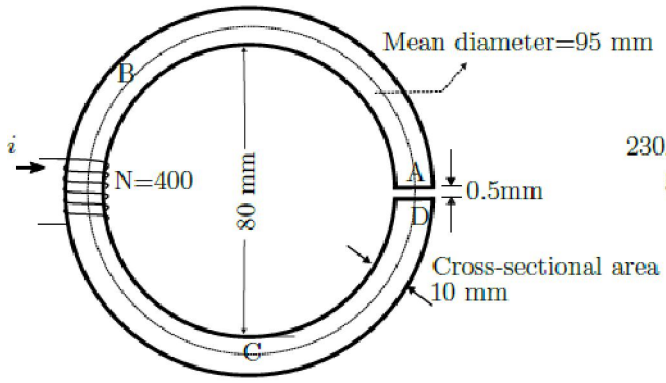

Figure 7: A series-parallel magnetic circuit

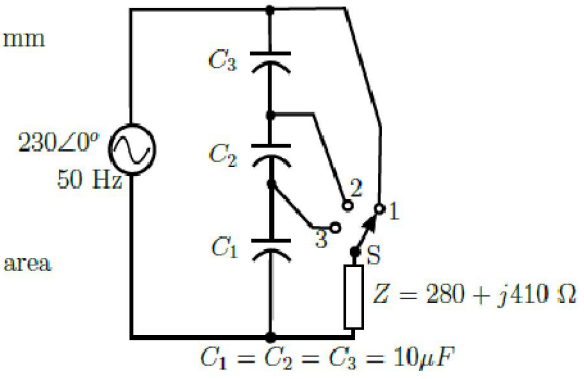

Figure 8: An ac loss-less regulator

16. Figure 8 is a loss-less voltage regulating circuit with three capacitors C_1,C_2 and C_3, all equal to 10μF. The ac load $Z = 280 + j410$ represents a fan motor. The switch S connects the fan impedance to one of the four points 1, 2, and 3. The power supply is $230\angle 0°$, at 50 Hz.

(a) Evaluate the capacitive reactance XC and express it in polar form. (1)
(b) Evaluate the total impedance across the source when the switch S is in position 1, 2 and 3 (Z_1, Z_2 and Z_3) respectively.
(c) For each of the position of S, calculate the currents taken from the source. Express them in polar form.

PART C

Answer TWO full questions. Each full question carries 10 marks.

17. (a) Define complex power. How is it related to `Apparent Power'? (4)
(b) A resistance of 400, an inductance of 318 H are connected in parallel. Find the capacitance of a capacitor which, when connected in parallel with the combination, will produce resonance with a supply frequency of 1 MHz. If a second capacitor of capacitance 23.5 pF is connected in parallel with the first capacitor, find the frequency at which resonance will occur. What is the Q-factor in each case?

OR

18. (a) Define quality factor. Give the expression for Q-factor in a series R-L-C circuit.(2)
(b) See Figure 9. The resistance is 20 Ω and the capacitive and inductive reactances are -j20 and j20 respectively. If an average power of 500 W is dissipated in the 20 Ω resistor, find (a) |Vrms| of the voltage across the resistor, (b) |IL;rms|, (c) |Isrms|, (d) the power factor seen by the source, and (e) |Vs;rms|.

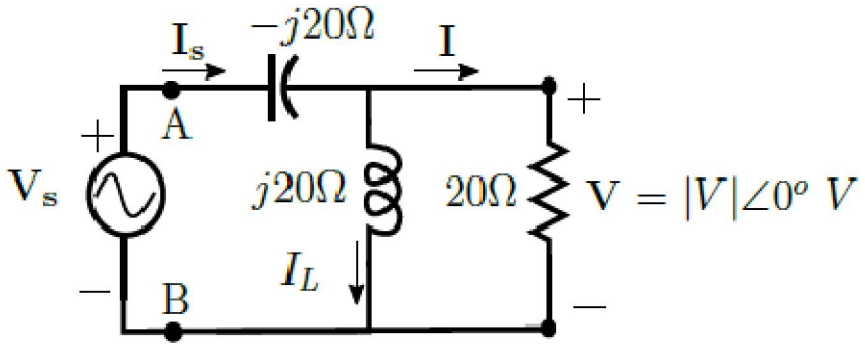

Figure 9: A series-parallel ac circuit

19. (a) A 600 V rms three-phase Y-connected source has two balanced Δ loads connected to the lines. The load impedances are 40∟30° and 50∟- 60° respectively.
Determine the rms line current and the total average power.
(b) For power measurement in three-phase circuits, under which circumstances will you use (i) Three wattmeter method, (ii) Single wattmeter method and (iii) Two wattmeter method? Write answers in not more than two sentences for each case.

OR

20. The two-wattmeter method is used to determine the power drawn by a three-phase 440 V rms motor that is a Y-connected balanced load. The motor draws a power of 20 kW. The magnitude of the line current is 52.5 A rms. The wattmeters are connected in the A and C lines. Find the reading of each wattmeter. The motor has a lagging power factor. Draw the phasor diagram showing the voltages and currents measured by the two wattmeters.

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Total Pages: 3

Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: BE101-03

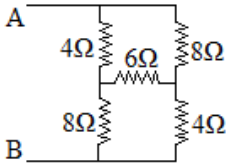
Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

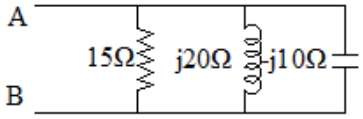
PART A

Answer all questions, each carries 4 marks.

1		Differentiate between self-inductance and mutual inductance. What is meant by Coupling coefficient?	(4)
2		State and explain Kirchhoff's current and voltage laws with the help of neat diagram.	(4)
3		Find the equivalent resistance R_{AB}	(4)



4		Compare electric and magnetic circuits in terms of any two similarities and two differences.	(4)
5		Find equivalent impedance of the circuit shown in figure	(4)



6		Draw the phasor diagram showing the following voltages v_1= 100sin(500t), v_2= 200sin(500t+45^o), v_3= -50cos(500t). Also find the expression of resultant voltage of the three.	(4)
7		What is meant by resonance in electric circuit? Write the expression for resonance frequency of a series RLC circuit.	(4)
8		With the help of an RLC circuit explain the concept of complex power and power factor.	(4)
9		Calculate the phase and line values of voltage and current in a 3-phase star connected balanced network with phase impedance (6+j10) Ω and supply voltage 100 V, 50 Hz.	(4)
10		Derive the relation between phase values of current and voltage of a delta connected 3 phase circuit to the line values with the help of phasor diagram.	(4)

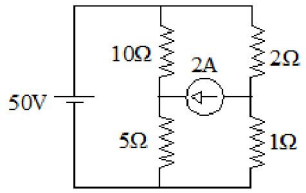
PART B

Answer any four full questions, each carries 10 marks.

11	a)	State Faraday's laws of electromagnetic induction and differentiate between statically and dynamically induced emfs.	(4)
	b)	Two coils A and B 600 and 100 turns respectively are wound uniformly around a wooden ring of mean circumference 80 cm. The cross-sectional area of the ring is 4cm^2. Calculate self-inductance of each coil, mutual inductance between coils, emf induced in the coil B when a current of 2A in coil A is reversed in 0.01 second.	(6)

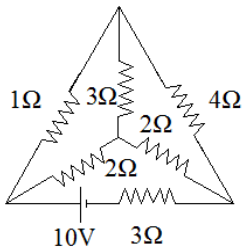
12 a) Derive the expression for energy stored in an inductor. (4)

b) Find the values of branch currents in the circuit shown below using mesh analysis. (6)



13 a) Differentiate between ideal and real current sources with the help of terminal V-I characteristics and circuit representations. (4)

b) Find the branch currents in the circuit shown below using node analysis. (6)

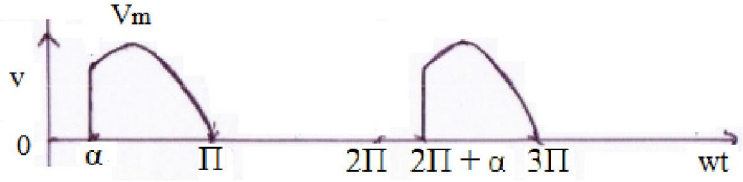


14 a) Define the terms - mmf, flux, reluctance and permeability. (4)

b) A steel ring, 30 cm mean diameter, has an air gap of 1mm long. It is wound uniformly with 600 turns of wire carrying a current of 2.5 A. Neglect magnetic leakages. The iron path has about 40% of the total mmf. Estimate the values of mmf in air gap, magnetic flux in iron path, reluctance of iron path and flux density in air gap. (6)

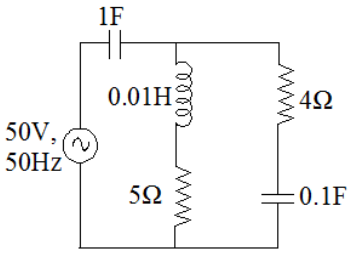
15 a) What is meant by the terms rms value, average value, peak factor and form factor in connection with periodic waveforms. (4)

b) Find the average value rms value and form factor of the sinusoidal voltage shown in figure, where Vm =100V, $\alpha = \pi/4$ (6)



16 a) Prove that the current through a pure inductor lags 90^o the sinusoidal voltage applied across it. (4)

b) Calculate the branch currents in the circuit shown below. (6)



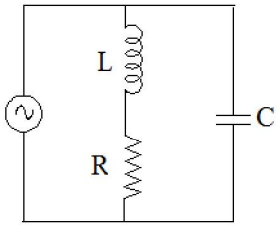
PART C

Answer any one full question from each module, each carries 10 marks.

Module V

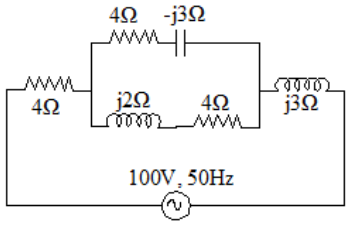
17 a) Define the terms band width and quality factor. Explain the significance of both. (4)

b) Derive the resonance frequency of the circuit shown below. (6)



18 a) Point out any four differences of series and parallel resonance. (4)

b) Calculate the real power, reactive power, apparent power and power factor of the circuit. (6)



Module VI

19 a) List the advantages of 3 phase ac over single phase ac. (4)

b) A 3 phase 4 wire star connected load of phase impedances $Z_1 = (16 + j12)\ \Omega$, $Z_2 = (14 - j21)\ \Omega$ and $Z_3 = 25\ \Omega$ is connected across a 254 V, 50 Hz ac supply. Calculate the current in each phase of the load and power consumed by the load. (6)

20 a) Describe how the two watt meter method is used for real and reactive power measurement in a 3phase 3 wire circuit. (6)

b) A 3 phase balanced load connected across a 3 phase 400V ac supply draws a line current of 10 A. Two wattmeters are used to measure input power. The ratio of two wattmeter readings is 2:1. Find the readings of the two wattmeters. (4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: BE101-03

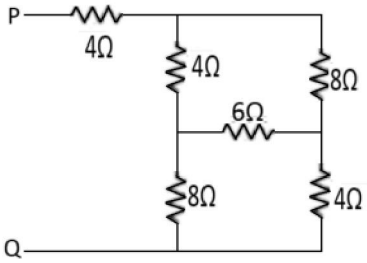
Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 4 marks. Marks

1		State and Explain Lenz's Law.	(4)
2		Derive the expression for energy stored in inductance.	(4)
3		Using star delta transformation find the total resistance between points P and Q for the circuit shown below.	(4)

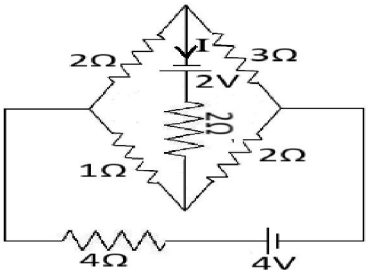


4		What are the dissimilarities of electric and magnetic circuits.	(4)
5		A flux of 0.04Wb is produced in a solenoid of axial length 25cm with 500 turns carrying a current of 4A. Find the magnetizing force and reluctance of the magnetic circuit.	(4)
6		Prove that power absorbed in a pure inductor is zero.	(4)
7		Define resonance in series RLC circuit and derive the expression for resonant frequency for the same.	(4)
8		A resistance of 10Ω connected in series with an inductive reactance of 30Ω is connected across a 230V, 50Hz supply. Determine the following: i) Active power ii) Reactive power iii) Power factor.	(4)
9		What are the advantages of star connected system?	(4)
10		Derive the relationship between line and phase values of voltages and current in a delta connected system.	(4)

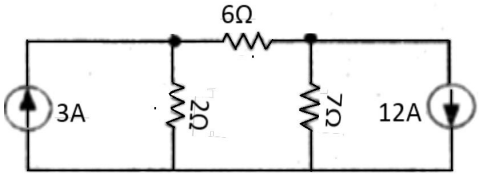
PART B

Answer any four full questions, each carries 10 marks.

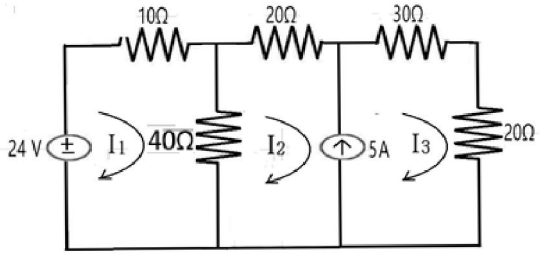
11	a)	The number of turns in a coil is 250. When a current of 2A flows in this coil the flux in the coilis 0. 3mWb.When this current is reduced to zero in 2ms, the voltage induced in the nearby coil is 63.75 volts. The coefficient of coupling between the two coils is 0.75. Find the self-inductances of the two coils, mutual inductance and number of turns in the second coil.	(6)
	b)	What is ideal voltage source and ideal current source? Explain.	(4)
12	a)	State and Explain Kirchhoff's Laws.	(4)
	b)	Find the current I in the circuit shown below using Kirchhoff's laws.	(6)



13 a) Find the current through the 6Ω resistor using Nodal Analysis. (4)



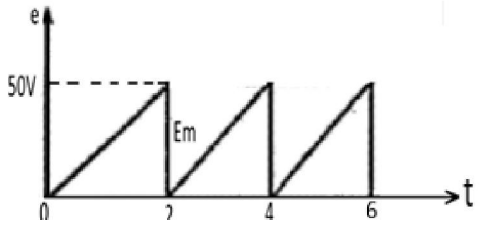
b) Using Mesh Analysis determine the currents I_1, I_2 and I_3 in the circuit shown in figure. (6)



14 a) A circular iron ring has a cross-sectional area of $0.01m^2$ and a mean circumference of 1.5m. A saw cut of 4mm wide is made in the ring. Calculate the magnetising current required to produce a flux of 0.8mWb in the air gap if the ring is wound with a coil of 175 turns. Assume relativepermeabilityof iron as 400 and leakage factor as 1.25. (5)

b) Define the terms flux, permeability and m.m.f with respect to magnetic circuits. (5)

15 a) Find the form factor of the waveform shown in figure. (5)



b) A coil of resistance 8Ω and inductance 0.03H is connected to an a.c supply of 240V, 50Hz. Calculate: (5)

i) The current, power and power factor of the circuit.

ii) The value of capacitance which when connected in series with the above coil causes no change in the value of current and power taken from the supply.

16 A non-inductive resistor of 10Ω is connected in series with a choke coil having internalresistance of 1.2Ω and is fed from a 200V, 50 Hz supply. Current flowing through the circuit is 8A. Calculate: (10)

i) Inductance of the choke coil ii) Voltage across the choke coil

iii) Power absorbed by the choke coil iv) Power absorbed by non-inductive resistor v) Total power absorbed. vi) Phasor diagram of the voltages in the

circuit.

PART C

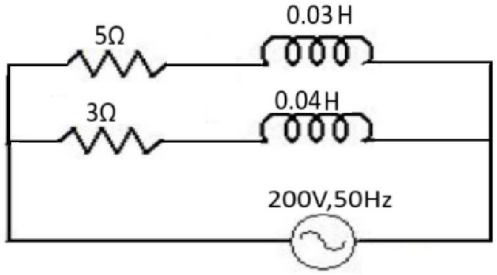
Answer any one full question from each module, each carries 10 marks.

Module V

17 a) What is active power and reactive power in an ac circuit? Explain. (4)

b) For the circuit shown in figure determine: (6)

i) The admittance in each branch ii) Total admittanceiii) Total current drawniv) Circuit power factor v) Power absorbed.



18 a) Draw the resonance curve of series RLC circuit (3)

b) A series RLC circuit has R= 5Ω, L=0.2H and C=50μF. The applied voltage is 200V. Find the: (7)

i) Resonant frequency ii) Q-factor iii) Band width

iv) Half power frequencies v) Current at resonance vi) Current at half power points vii) Voltage across inductance at resonance.

Module VI

19 a) What are the advantages of three-phase system over single-phase system? (4)

b) A balanced delta connected load consists of (5+j3) Ω in each branch. The line voltage is $300\sqrt{2}$ volts. Find: (6)

i) Line and phase currents ii) Real and apparent power.

20 a) Show that power consumed by three identical single-phase loads connected in delta is equal to three times the power consumed when the loads are connected in star. (6)

b) In the two-wattmeter method of 3 phase power measurement, the power input to load is 30kW at 0.397 lagging. Find the reading of each wattmeter. (4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, JULY 2018

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

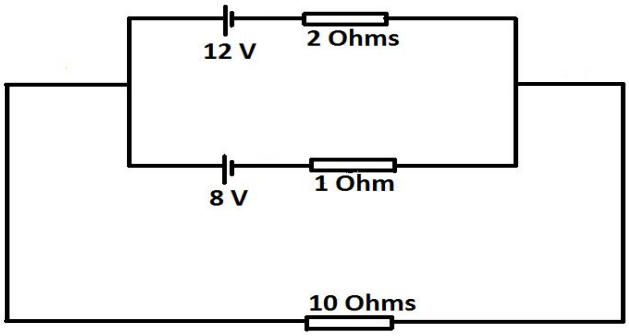
Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries4 marks Marks

1 State and explain Faraday's laws of electromagnetic induction. (4)

2 Determine the current flowing from each of the batteries in the circuit shown in figure. (4)



3 Derive the expression for coefficient of coupling. (4)

4 Differentiate between electric and magnetic circuits. (4)

5 A Capacitor of capacitance 79.5μF is connected in series with a pure resistance of 30Ω across a 100V, 50Hz supply. Find: (4)
i) Impedance ii) Current iii) Phase angle.

6 Define the following terms and derive its values for a pure sinusoidal wave: (4)
i) Form factor ii) Peak factor

7 Draw the power triangle and define 3 powers in a power triangle. (4)

8 What is Resonance? Explain the condition of Resonance in a series RLC circuit. (4)

9 Define power factor and find the power factor when $Z=30\angle 45^{o}$. (4)

10 A 3-phase, 10 kVA load has a power factor of 0.342. The power is measured by two wattmeter method. Find the reading of each wattmeter when the PF is: (4)
i) Lagging ii) Leading

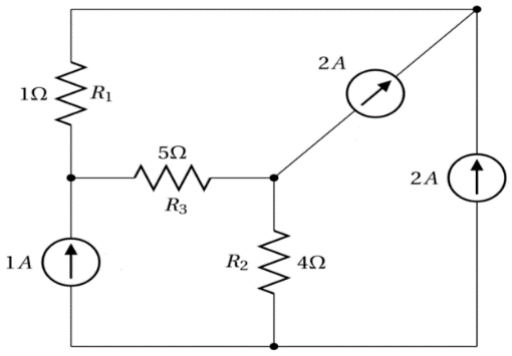
PART B

Answer any four full questions, each carries10 marks

11 a) Derive the expression for energy stored in a magnetic field. (5)

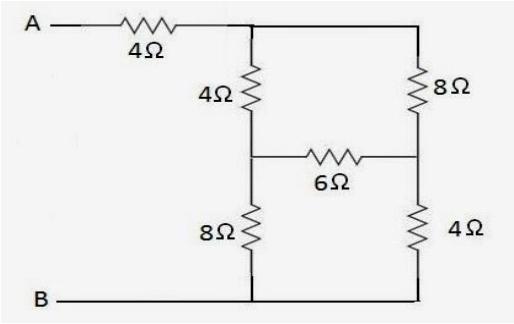
b) Explain briefly, Real and Ideal independent voltage and currentsources. (5)

12 a) Use nodal analysis to find currents in the various branches of the circuit shown in figure. (6)

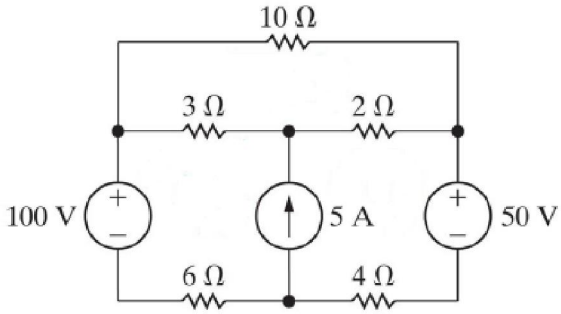


b) State and explain Kirchhoff's current and voltage laws. (4)

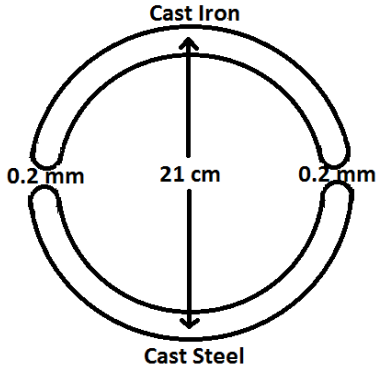
13 a) Find the equivalent resistance between A & B in the given network. (4)



b) Use mesh analysis to find currents in the various branches of the circuit shown in figure below. (6)



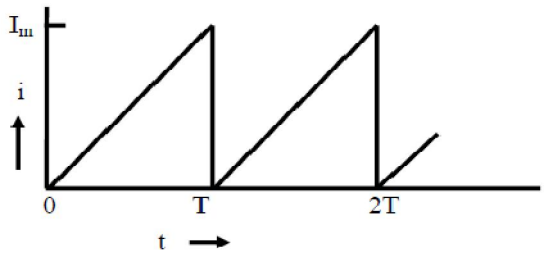
14 a) A ring of mean diameter 21cm and cross section 10cm^2 is made up semi-circular sections of cast steel and cast iron. If each joint has reluctance equal to an air gap of 0.2mm as shown in figure, find the ampere turns required to produce a flux of 5×10^{-4}weber in the magnetic circuit. Take μ_r for steel and iron as 825 and 165 respectively. Neglect leakage and fringing. (6)



b) Draw and explain the phasor representation of voltage and current in a pure (4)

capacitor, when an alternating voltage of $v=V_m\sin(\omega t)$ is applied across it.

15 a) Calculate average value, RMS value and Form factor of the sawtooth wave show in thefigure. (8)



b) Explain the phasor representation in polar and rectangular forms. (2)

16 a) Draw and explain the phasor representation and waveforms of voltage and current in an RL circuit when a pure sinusoidal voltage is applied across it. (6)

b) An RLC series circuit has a 1kΩ resistor, a 150μH inductor, and a 25 nF capacitor: (4)

i) Find the circuit's impedance at 7.50 kHz.

ii) If the voltage source has V_{rms}= 408V, what is I_{rms}?

PART C

Answer any one full question from each module, each carries10 marks

Module V

17 a) A coil having a resistance of 7Ω and an inductance of 31.8mH is connected to 230V, 50Hz supply. Calculate: (6)

i) The circuit current ii) Phase angle iii) Power factor

iv) Power consumed v) Reactive power vi) Apparent power

b) Draw and explain impedance triangle. (4)

18 a) Explain about Parallel Resonance and derive the expression for Q-factor. (6)

b) Two impedances z_1=6+j8 and z_2= 4-j10 are connected in parallel across a 50 Hz voltage supply. The supply current is 20A. (4)

i) Find the real, reactive and apparent powers drawn by each impedance.

ii) Find the source voltage.

Module VI

19 a) With suitable circuit diagram and phasor representations, explain the power measurement in a three-phase system using two-wattmeter method. (6)

b) Determine the phase powers consumed by a three-phase star connected load consisting of inductors having an impedance of 24Ω with a power factor of 0.8 lagging, when supplied from a three-phase 415 V, 50 Hz source. (4)

20 a) Derive the relation between phase and line values of voltages and currents in a star connected system. Also draw the phasor diagram. (6)

b) A 3-phase, 400V load has a power factor of 0.6 lagging. The two wattmeters read a total input power of 20kW. Find the readings of each wattmeter. (4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

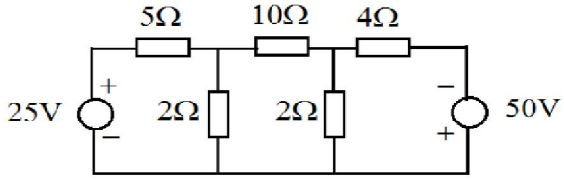
Answer all questions, each carries 4 marks. Marks

1	Define self inductance of a coil. Derive an expression for the self inductance.	(4)
2	State and explain Kirchhoff's voltage and current laws.	(4)
3	Draw series and parallel magnetic circuits and show their electrical equivalents.	(4)
4	A magnet of square cross-section with a side of 5 cm has a magnetic flux of 0.5 mWb. Calculate magnetic flux density.	(4)
5	An alternating current is given by i=62.35 sin(323t) A. Find its frequency and form factor.	(4)
6	Find the peak factor of a sinusoidal wave.	(4)
7	What is resonant frequency? Why parallel resonance is called current resonance?	(4)
8	Explain the terms real, reactive and apparent powers.	(4)
9	Compare star and delta connection of three phase circuits.	(4)
10	Two watt meters are connected to measure power in a 3 phase circuit. One of the wattmeters reads 500 W and the other points in the reverse direction. After reversing the voltage coil terminals, the reading of this wattmeter is found to be 200 W. Determine the power factor of the load and total power of the circuit.	(4)

PART B

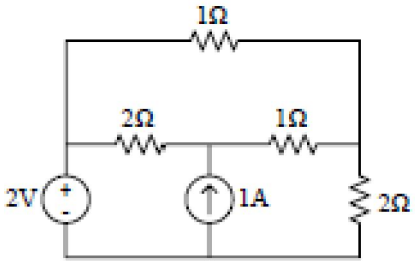
Answer any four full questions, each carries 10 marks.

11	a)	List the factors on which the reluctance of a magnetic material depends.	(2)
	b)	A coil consists of 1000 turns of wire uniformly wound on a non-magnetic ring of mean diameter 25 cm and cross sectional area 10cm^2. Calculate (i) The inductance of the coil (ii) Energy stored in the magnetic field when the coil is carrying 12A current, and (iii) Emf induced in the coil if this current is completely interrupted in 0.01s.	(8)
12		For the circuit shown, find voltage across the 10 Ω resistor using i) Nodal analysis and ii) Mesh analysis	(10)

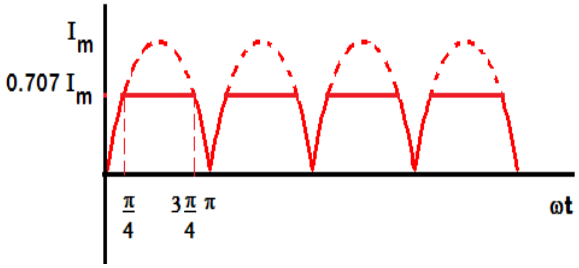


13 A magnetic core in the form of a closed ring has a mean length of 20 cm and cross sectional area of 1 cm^2 .The relative permeability of iron is 2400. What direct current will be needed in a coil of 2000 turns uniformly wound around the ring to create a flux of 0.2 mWb? If an air gap of 1mm is cut through the core, what current will now be needed to maintain the same flux in the air gap? What fraction of the ampere turns is required to maintain the flux in the air gap? (10)

14 Evaluate the power delivered by the 2V source in the circuit below using mesh current method. (10)



15 Determine rms and average values of the given waveform: (10)



16 Find the total current taken by a parallel circuit connected across a 200 V 50 Hz supply. The parallel circuit is made up of three branches having impedances of$(6 + j8)\Omega, (4 - j3)\Omega$ *and* $(20 - j10)\Omega$. Also find the power factor of the whole circuit. Use admittance method. (10)

PART C

Answer any one full question from each module, each carries10 marks.

Module V

17 An inductive coil of resistance 10 Ω, and an inductance of 20 mH are connected in series with a capacitor of 10 μF. Calculate the frequency at which the circuit resonate. If a voltage of 50 V at resonant frequency is applied across the circuit, calculate the voltage across the circuit components and the Q factor. (10)

18 When a 230 V, 50 Hz supply is applied across a resistor of 10 Ω in parallel with a pure inductor, the total current drawn from the supply is 25 A. When the supply frequency is changed, the total current drawn is 36 A. Calculate the new frequency. (10)

Module VI

19 a) A 3 phase four wire 400V, RYB system supplies a star connected load with (5)

$Z_R=10<0^o$, $Z_Y=15<30^o$ and $Z_B=10< -30^o$. Find the line currents and neutral current.

b) The two wattmeters connected to a three phase three wire balanced delta connected load reads 1154 W and 557 W. Obtain the load impedance if the line voltage is 141.4V. (5)

20 a) Two wattmeters W_1 and W_2 are used for measuring power in a three phase circuit. Prove that the sum of wattmeter readings gives the total power consumed by the load and the difference of wattmeter readings gives the total reactive power. Also derive the power factor of the circuit. (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries4 marks. Marks

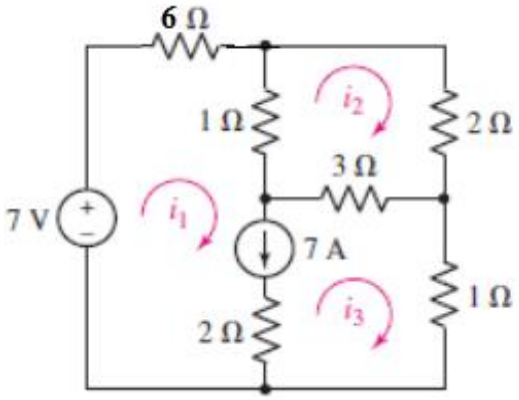
1		Deduce an expression for the energy stored in a magnetic field?	(4)
2		A coil of 160 turns is linked with a flux of 0.02 Wb when carrying a current of 12A. Calculate the inductance of the coil. If the current is uniformly reversed in 0.02 s, calculate the induced emf.	(4)
3		State and explain Kirchhoff's voltage and current laws.	(4)
4		Distinguish between self and mutual inductances. Derive an expression for the self inductance of a coil.	(4)
5		Express $i(t) = 20 \sin(628t - 30)$ in polar and rectangular forms.	(4)
6		Prove that the power consumed by a purely capacitive ac circuit is zero.	(4)
7		Distinguish between (i) apparent power, (ii) active power, and (iii) reactive power.	(4)
8		Prove that average power in an ac circuit is VI cosϕ, where V is the RMS value of voltage, I is the RMS value of current and cosϕ is the power factor.	(4)
9		Calculate the line currents, power factor and power consumed in a three phase star connected load consisting of three equal impedances of (20+j10) Ω connected across a three phase source of 400V, 50Hz.	(4)
10		Write any four advantages of three phase systems over single-phase systems.	(4)

PART B

Answer any four full questions, each carries10 marks.

11	a)	State and explain Faraday's laws of electromagnetic induction.	(4)
	b)	A coil of 800 turns is wound on a ring of silicon steel, having mean diameter of 9 cm and relative permeability of 1100. Its cross sectional area is 12cm^2. When a current of 6 A flows through the coil, find i. Flux in the core ii. Inductance of the coil iii. Induced emf if the flux falls to zero in 20ms.	(6)
12		Use Mesh analysis to determine currents I_1, I_2, I_3 and current through the 3Ω	(10)

resistor in the circuit below.

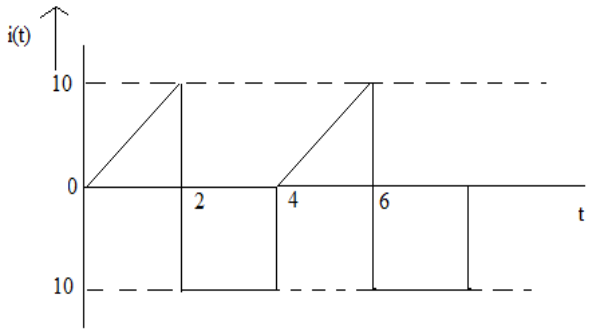


13 An iron ring has a diameter of 21 cm and a cross sectional area of 10 cm^2. The ring is made up of semicircular sections of cast iron and cast steel with an air gap of 0.2 mm. Find the ampere turns required to produce a flux of 8 mWb. The relative permeability of cast steel and cast iron are 800 and 166, respectively. (10)

14 a) Compare (by writing both similarities and differences) electric and magnetic circuits. (6)

b) Derive the equivalent reluctance of two magnetic circuits in parallel. (4)

15 Determine the RMS and average values of the current waveform shown below. (10)



16 A non inductive resistor of 10Ω is connected in series with a choke coil having an internal resistance of 1.2 Ω and is fed from a 200 V, 50 Hz supply. The current flowing through the circuit is 8 A. Calculate (i) Inductance of the choke coil (ii) Voltage across the choke coil (iii) Power absorbed by the choke coil (iv) Power absorbed by the non-inductive resistor (v) Phasor diagram of voltage. (10)

PART C

Answer any one full question from each module, each carries10 marks.

Module V

17 A 50Hz sinusoidal voltage of (40+j30) V is applied to a series RL circuit resulting in a current of (4+j1) A. Calculate (i) Impedance of the circuit (ii) (10)

Power consumed in the circuit (ii) Power factor of the circuit.

18 a) an R-L-C series circuit with R=10 Ω, L=0.1 H and C=10 μF is excited with an alternating voltage source. Determine the impedance (i) at resonant frequency, (ii)10 Hz above resonant frequency and (iii) 10 Hz below resonant frequency. (8)

b) Draw the variation of impedance with respect to frequency of an R-L-C series circuit. (2)

Module VI

19 a) Compare star and delta connected three phase power supply systems. (4)

b) A three-phase delta connected load consists of three similar impedances of (10+12j) Ω. Find the line current and total power absorbed if it is connected to a 415V, 50Hz supply. (6)

20 a) Calculate the phase and line currents and the load impedance parameters in a balanced delta connected load which consumes a power of 25 kW at 0.866 power factor lag fed from a three phase 400V, 50 Hz supply. (6)

b) A balanced three phase load consumes a power of 10 kW at 0.9 pf lag. If the power is measured by two wattmeter method, calculate the readings of the two watt-meters. (4)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIRST SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

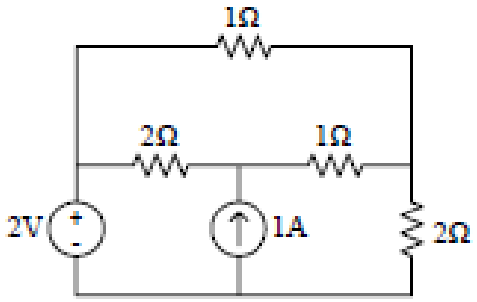
Answer all questions, each carries4 marks. Marks

1		State Faradays laws of electromagnetic induction.	(4)
2		Three resistors, 20 Ω, 90Ω and 10 Ω are connected in star. Obtain the equivalent delta circuit.	(4)
3		Distinguish between statically and dynamically induced emfs. List few electric equipments working on these principles.	(4)
4		Define mmf and reluctance.	(4)
5		A series connected load draws a current i(t)= 4 cos (100π t +10) A when applied across v(t) =120 cos (100πt -20) V. Find the value of load impedance and circuit power factor.	(4)
6		Find the form factor of a sinusoidal wave.	(4)
7		What are active and reactive powers? Draw the power triangle.	(4)
8		Define resonance in a series RLC circuit and derive the expression for resonant frequency.	(4)
9		Three identical resistors connected in delta is supplied from a three phase 400V, 50Hz supply and draws a line current of 4 A.Calculate the value of the resistors and power consumed in the resistors.	(4)
10		Derive the relationship between phase current and line current in a 3-phase delta connected system.	(4)

PART B

Answer any fourfull questions, each carries10 marks.

11	a)	Why inductors and capacitors are called energy storage devices?	(4)
	b)	An iron cored reactor is wound with 250 turns and has an air gap of 0.8 cm. The flux path in iron is 1.2 m and the cross sectional area is 0.15 m^2. Determine the inductance of the reactor when carrying a current of 10 A. Take relative permeability of iron as 1100.	(6)
12		Evaluate the power delivered by the 2V source in the circuit below using super mesh analysis.	(10)



13 a) Derive an expression for dynamically induced emf in a moving conductor, placed in a uniform magnetic field of flux density B Tesla. (4)

b) Tabulate the similarities and dissimilarities of electrical circuits and magnetic circuits. (6)

14 a) Define permeability and relative permeability. (4)

b) A steel ring has a circular cross-section of area 20 mm^2 and an average flux path length of 4 m. An air gap of length 10 cm is cut across the ring. Obtain the mmf required to establish a flux of 3 mWb in the air gap. Assume the relative permeability of steel as 1000. (6)

15 A current of 5A flows through a non inductive resistance in series with a choke coil when supplied at 250V, 50Hz. If the voltage across the resistance is 125V and that across the coil is 200V, calculate (i) Impedance, reactance and resistance of the coil (ii) Power absorbed by the coil and (iii) Total power absorbed by the circuit. (10)

16 a) Two impedances Z_1 and Z_2 when connected separately across a 200 V 50 Hz supply consume powers of 100 W and 60 W at power factors of 0.5 lagging and 0.6 leading respectively. If the impedances are now connected together in series across the same supply, determine the power absorbed and resulting power factor. (5)

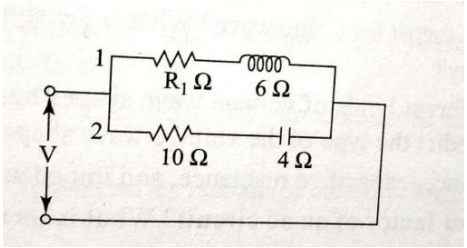
b) A resistance R, an inductance $L = 0.01H$ and a capacitance C are connected in series. When a voltage $v = 400\ cos(3000t - 10)\ V$ is applied to the series combination, the current flowing is $10\sqrt{2}\ cos(3000t - 55)\ A$. Find R and C. (5)

PART C

Answer any one full question from each module, each carries10 marks.

Module V

17 Calculate the value of R_1 in the circuit given such that circuit will resonate. (10)



18 a) Explain parallel resonance and draw graphs of Z, X_L and X_C against frequency (6)

b) Define bandwidth of a resonant circuit. Give the relationship of quality factor in terms of bandwidth and resonant frequency. (4)

Module VI

19 a) The total power consumed in a balanced star connected load is 20kW at 0.8 pf lag when supplied from a three phase 400 V, 50 Hz source. Calculate the line current, resistance and inductance of the load impedance. (6)

b) A balanced delta connected load connected across a 440V, 50 Hz three phase supply draws a line current of 16 A which lags behind the phase voltage by an angle of 36.86º. Calculate the impedance of the load, phase current, power factor, and total power. (4)

20 A 220V, 50Hz, 3 phase voltage is applied to a balanced delta connected load of phase impedance (6+8j) Ω. Find the line currents and power consumed per phase. Also draw the phasor diagram. (10)

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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech degree examinations (S), September 2020 (S1/S2 - 2015 Scheme)

Course Code: BE101-03

Course Name: INTRODUCTION TO ELECTRICAL ENGINEERING

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 4 marks.

		Marks
1	A conductor of length 0.4 m situated at right angles to a uniform magnetic field of flux density $1Wb/m^2$ moves with a velocity of 70m/s. Calculate the emf induced if the conductor moves at an angle 30^0 to the field.	(4)
2	State and explain Kirchhoff's voltage and current laws. These laws express the conservation of two important physical quantities. Name them.	(4)
3	Derive the expression for energy stored in an inductor.	(4)
4	A coil of 200 turns is wound on a wooden ring of radius 7.95 mm and cross-sectional area of 200 mm^2. Obtain flux density in the core and total flux, when a current of 10A is flowing through the coil.	(4)
5	Prove that the power consumed by a purely inductive ac circuit is zero.	(4)
6	Find the RMS value of a full wave rectified sinusoidal current.	(4)
7	What is meant by power factor of an ac circuit? What are its minimum and maximum values?	(4)
8	An impedance of (3+j4) Ω is connected across a 100V single phase ac supply. Find the current, active power, reactive power and power factor.	(4)
9	A balanced delta connected load consists of three $20\angle 40°$ Ω impedances connected to a three phase 400V, 50Hz supply. Find the line current, power factor and total power consumed.	(4)
10	List the advantages of three phase systems over single phase systems.	(4)

PART B

Answer any four full questions, each carries 10 marks.

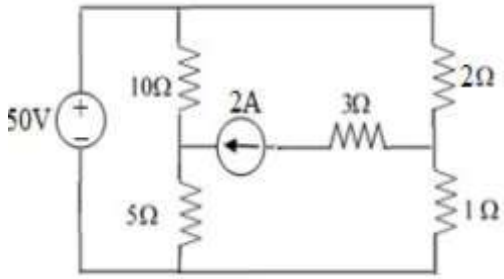
11	a)	Derive an expression for the energy stored in an inductor.	(4)
	b)	Coil A and B in a magnetic circuit have 750 and 600 turns respectively. A current of 10 A in coil A produces a flux of 0.02 Wb in it. If the coefficient of coupling is 0.2, calculate	(6)

i) Self-inductance of coil A when coil B is open circuited

ii) Emf induced in coil B when flux changes to zero in 0.01s, and

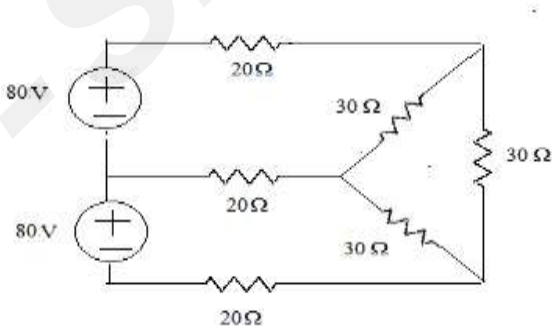
iii) Mutual inductance.

12 Determine the power delivered to the 10Ω and 5Ω resistors in the given circuit. (10)



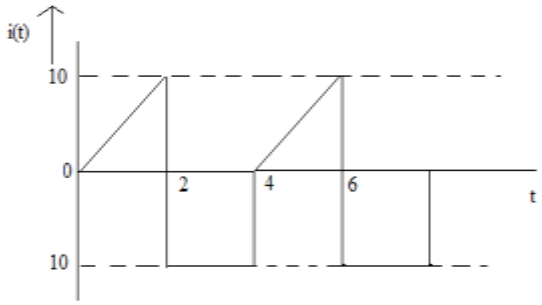
13 A magnetic core in the form of a closed ring has a mean length of 20 cm and cross sectional area of 1 cm^2. The relative permeability of iron is 2400. What direct current will be needed in a coil of 2000 turns uniformly wound around the ring to create a flux of 0.2 mWb in the iron? If an air gap of 1mm is cut through the core perpendicular to the direction of this flux what current will now be needed to maintain the same flux in the air gap? What fraction of the ampere turns is required to maintain the flux in the air gap? (10)

14 Write the mesh equations and find the mesh currents for the circuit shown below. Also find power delivered by the sources. (10)



15 A current of 5 A flows through a non inductive resistance in series with a choke coil when supplied at 250 V, 50 Hz. If the voltage across the resistance is 125 V and that across the coil is 200V, calculate (a) impedance, reactance and resistance of the coil, (b) the power absorbed by the coil, and (c) the total power. Also draw the phasor diagram of voltage. (10)

16 Determine the RMS and average values of the current waveform shown below. (10)



PART C

Answer any one full question from each module, each carries 10 marks.

Module V

17 An RLC series circuit consists of a resistance of 100 Ω, an inductance of 10 mH and capacitance of 10 μF. If a voltage of 200 V is applied across the combination find (i) resonant frequency (ii) Q factor of the circuit and half power frequencies. (10)

18 a) For an R-L-C series circuit with R=10 Ω, L=0.1 H and C=10 μF is excited with an alternating voltage source. Determine the impedance (i) at resonant frequency, (ii) 10 Hz above resonant frequency, and (iii) 10 Hz below resonant frequency. (8)

b) Draw the variation of impedance with respect to frequency of an R-L-C series circuit. (2)

Module VI

19 a) Three resistances 5 Ω, 10Ω and 15 Ω are connected in star and connected across a 230 V, 50 Hz supply. Calculate the current through each resistor. (6)

b) A balanced delta connected load of each arm has a resistance of 40 Ω per phase. Calculate the line, phase currents and power of the circuit if it is connected across a 440V, 50 Hz supply. (4)

20 a) Describe the measurement of power of a three phase circuit by two wattmeter method and obtain the expression for power and power factor. (10)

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