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Name:

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIRST/SECOND SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: EE100

Course Name: BASICS OF ELECTRICAL ENGINEERING

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each question carries 4 marks.

Marks

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| 1 | a) What is the difference between current source and voltage source? | (2) |
| | b) Draw the VI or IV characteristics of ideal & practical voltage and current sources. | (2) |
| 2 | a) How much more current can be safely drawn from a 120 V outlet fused at 15 A, if a 600 W curling iron and a 1200W hair dryer are already operating in the circuit? | (2) |
| | b) A certain light bulb with a resistance of 95Ω is labelled ' $150 W$ '. Was this bulb designed for use in a 120V circuit or a 220V circuit? Justify your answer. | (2) |
| 3 | a) An ideal mutual inductor is made from a primary coil of inductance 5mH and a secondary coil of inductance 10mH. Find the value of the mutual Inductance. | (2) |
| | b) A DC source of 20V is applied to a series combination of a $5k\Omega$ resistor and a 4mH inductor. Find the equilibrium value of the energy stored in the magnetic field. | (2) |
| 4 | Derive the relation between line current and phase current when a balanced 3-phase three wire supply is fed to a 3-phase delta connected pure resistive load ($R \Omega$ of equal value connected in each arm). | (4) |
| 5 | a) Define renewable energy. | (1) |
| | b) Enumerate major types of geothermal renewable energy resources. | (3) |
| 6 | What do you mean by distribution system? How feeder is different from distributor? | (4) |
| 7 | Derive the emf equation of transformer. | (4) |
| 8 | What is the principle of operation of a DC motor? What are the constructional differences between series and shunt field windings? | (4) |
| 9 | Distinguish between squirrel cage and slip ring rotors of 3-phase induction motor. | (4) |
| 10 | Compare three-phase and single-phase induction motors. | (4) |

PART B

MODULE (1-4)

Answer any four questions, each question carries 10 marks.

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| 11 | a) Obtain the voltage drops across all resistor of the circuit shown in Fig. 1 using nodal analysis. All the values of the resistances are in Ω . | (6) |
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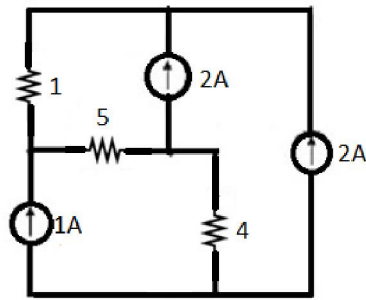


Figure 1.

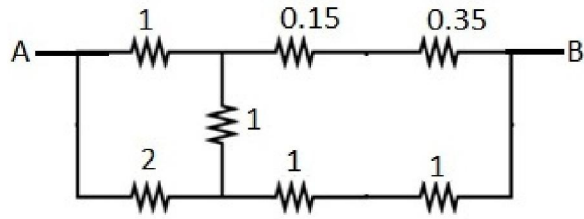


Figure 2.

- b) Use star-delta/ delta- star transformation to determine the equivalent resistance between the points A and B of the circuit shown in Fig. 2. All the values of the resistances are in Ω . (4)
- 12 a) A closed magnetic circuit of cast steel contains a 6cm long path of cross-sectional area 1 cm^2 and a 2cm path of cross-sectional area 0.5 cm^2 . A coil of 200 turns is wound around the 6 cm length of the circuit and a current of 0.4 A flows through it. Determine the flux density in the 2 cm path of the magnetic circuit. Relative permeability of cast steel is 750. (6)
- b) Derive an expression for dynamically induced emf in a moving conductor in terms of magnetic flux density (B), length of the conductor (l), velocity (v) and the angle between B and v (4)
- 13 a) Tabulate the similarities and dissimilarities of electrical circuits and magnetic circuits (6)
- b) A hollow air cored inductor coil consists of 500 turns of copper wire which produces a magnetic flux of 10 mWb when passing a DC current of 10 A. (4)
 - (i) Calculate the self-inductance of the coil in mH.
 - (ii) calculate the value of the self-induced emf produced in the same coil after a time of 10ms.
- 14 a) Find the total voltage across the terminals A and B of the circuit shown in Fig. 3. Draw the waveforms of the voltages $3\angle 0^\circ$, $4\angle 180^\circ$ and V_{AB} . (3)

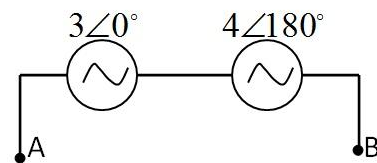


Figure 3.

- b) A series circuit consisting of a capacitor of $2 \mu\text{F}$ and a resistance of 500Ω . An AC source is connected to the circuit which draws a current of $50\angle 0 \text{ mA}$. The angular frequency of AC source is 400π . (i) draw the circuit and find the source voltage (ii) find the voltage across the capacitor and resistor (iii) draw the voltage phasor diagram. (7)
- 15 a) A three-phase load consumes 100 kW, and 50 kVAR. Determine the apparent power and the power factor angle. (2)

- b) A star connected balanced three phase load of $(10+j10) \Omega$ is supplied from a star connected balanced three phase supply with $V_{AB} = 100\sqrt{3}\angle 0^\circ$ V. Two single phase wattmeters are connected to measure three phase power. Determine: -i) Wattmeter readings of W_A and W_C ii) Three phase real power iii) Three phase reactive power
- 16 With neat sketches, describe the main components of a nuclear power plant. (10)

MODULE 5

Answer any one full question, carries 10 marks.

- 17 a) How back emf is generated in a DC motor? What is the significance of back emf? (3)
- b) With electrical circuit diagram, give detailed description of various types of DC motors. Elaborate the characteristics of each type. (7)

OR

- 18 a) A 200 kVA rated transformer has a full-load copper loss of 1.5 kW and an iron loss of 1 kW. Determine the transformer efficiency at full load and 0.85 power factor. (6)
- b) How hysteresis and eddy current losses are minimized in a transformer? (4)

MODULE 6

Answer any one full question, carries 10 marks.

- 19 a) Define the terms: (4)
- synchronous speed
 - slip
 - slip speed
 - rotor speed.
- b) A 3-phase 50Hz induction motor has a full load speed of 960 rpm. (6)
- Find the:
- Slip
 - Number of poles
 - Frequency of rotor induced emf
 - Speed of rotor field with respect to rotor
 - Speed of rotor field with respect to stator
 - Speed of rotor field with respect to stator field.

OR

- 20 a) List out any four types of single phase induction motors. (2)
- b) Write down the constructional details and working of capacitor start induction motor. Draw relevant phasor diagram. (8)
