

Reg No.: .....

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**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

- |    |    |  |     |
|----|----|--|-----|
| 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 $95 \Omega$ 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.*

- |    |    |   |     |
|----|----|---|-----|
| 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 $\Omega$ . | (6) |
|----|----|---|-----|

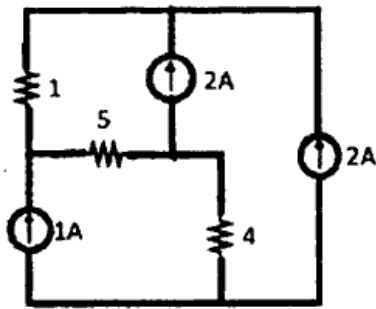


Figure 1.

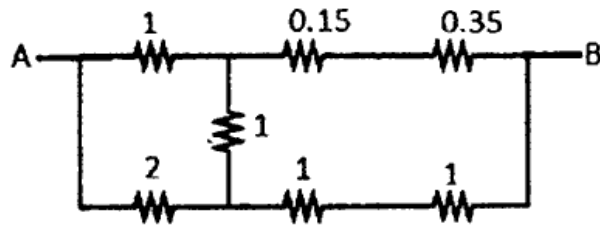


Figure 2.

- 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  $\Omega$ . (4)
- 12 a) A closed magnetic circuit of cast steel contains a 6cm long path of cross-sectional area  $1 \text{ cm}^2$  and a 2cm path of cross-sectional area  $0.5 \text{ cm}^2$ . 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 10mWb 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)

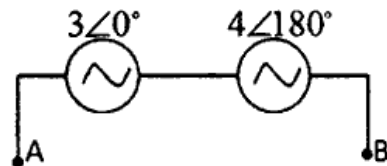


Figure 3.

- b) A series circuit consisting of a capacitor of  $2 \mu\text{F}$  and a resistance of  $500 \Omega$ . 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  $400\pi$ . (7)  
 (i) draw the circuit and find the source voltage  
 (ii) find the voltage across the capacitor and resistor (iii) draw the voltage phasor diagram.
- 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. (8)

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)  
i) synchronous speed ii) slip iii) slip speed iv) rotor speed.  
b) A 3-phase 50Hz induction motor has a full load speed of 960 rpm. (6)  
Find the:  
i) Slip  
ii) Number of poles  
iii) Frequency of rotor induced emf  
iv) Speed of rotor field with respect to rotor  
v) Speed of rotor field with respect to stator  
vi) 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)

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