

**B.TECH**  
**(SEM I) THEORY EXAMINATION 2022-23**  
**BASIC ELECTRICAL ENGINEERING**

Time: 3 Hours

Total Marks: 100

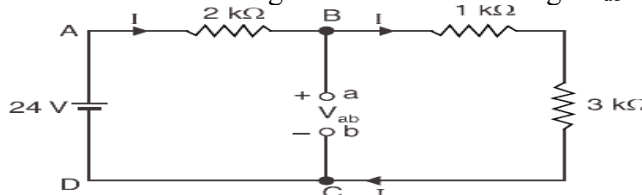
**Note:** Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief.**

**10 x 2 = 20**

- (a) Explain the advantage of Nodal analysis over Mesh analysis.  
 (b) Use Kirchhoff's voltage law to find the voltage  $V_{ab}$ .



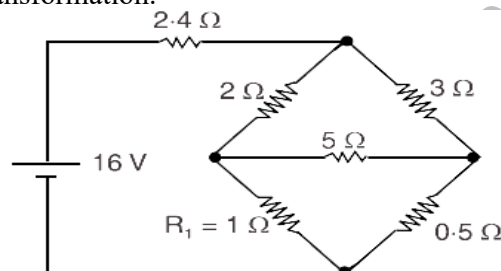
- (c) A coil having a resistance of  $7\Omega$  and an inductance of  $31.8 \text{ mH}$  is connected to  $230 \text{ V}$ ,  $50 \text{ Hz}$  supply. Calculate power factor  
 (d) Draw the Impedance triangle of inductive circuit.  
 (e) A magnetic circuit has m.m.f. of  $400 \text{ AT}$  and reluctance of  $2 \times 10^5 \text{ AT/Wb}$ . Find out magnetic flux in the magnetic circuit.  
 (f) Write advantages of Auto-transformer over single phase transformer.  
 (g) State the characteristics of synchronous motor.  
 (h) A three phase,  $50 \text{ Hz}$  induction motor has a 4 poles full load speed of  $1440 \text{ rpm}$ . Find out full load slip.  
 (i) A ceiling fan of  $200 \text{ watt}$  is used for four hours per day, and for 120 days per year, what would be the annual energy consumption? If the price per kWh for electricity is Rs 6, what is the annual cost to operate the ceiling fan?  
 (j) What is the necessity of earthing?

**SECTION B**

**2. Attempt any three of the following:**

**3x10=30**

- (a) Find out total current drawn from the voltage source ( $16 \text{ V}$  battery), By Star/Delta transformation.



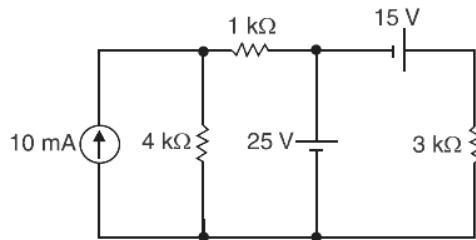
- (b) Find the average value, r.m.s. value, form factor and peak factor for halfwave rectified alternating current.  
 (c) Draw the Equivalent circuit of the transformer, referred to secondary side. The equivalent parameters of a transformer, having a turns ratio of 5, are  $R_1=0.5\Omega$ ,  $R_2=0.021\Omega$ ,  $X_1=3.2\Omega$ ,  $X_2=0.12\Omega$ . Determine Equivalent resistance, reactance and impedance referred to secondary side, and total copper loss.

- (d) Explain the basic principle of working of DC Machine and derive the back EMF equation.
- (e) Explain the following characteristics for Battery: Battery Backup time, Ampere-hour efficiency, watt-hour efficiency, Service life.

### SECTION C

**3. Attempt any one part of the following: 1x10=10**

- (a) Using the superposition principle, find the voltage across  $1\text{ k}\Omega$  resistor



- (b) Explain in detail the procedure for finding the Thevenin's equivalent circuit.

**4. Attempt any one part of the following: 1x10=10**

- (a) Prove that the power absorbed in a pure capacitance is zero. A  $318\mu\text{F}$  capacitor is connected to  $230\text{V}$ ,  $50\text{ Hz}$  find out capacitive reactance, rms value of current.
- (b) A choke coil takes a current of  $2\text{A}$  lagging  $60^\circ$  behind the applied voltage of  $200\text{ V}$  at  $50\text{Hz}$ .
- (i) Calculate impedance, resistance and inductance of the coil.
  - (ii) Also find the power consumed when the coil is connected across  $100\text{ V}$ ,  $25\text{ Hz}$  supply.

**5. Attempt any one part of the following: 1x10=10**

- (a) Explain in detail the properties of following magnetic material with examples: diamagnetic, paramagnetic, ferromagnetic material.
- (b) Explain in detail various three-phase transformer connections.

**6. Attempt any one part of the following: 1x10=10**

- (a) A  $25\text{kW}$ ,  $250\text{-V}$ , DC shunt motor has armature and field resistances of  $0.06\ \Omega$  and  $100\ \Omega$  respectively. Determine the total armature power developed when working as i. a generator delivering  $25\text{kW}$  as output ii. a motor taking  $25\text{ kW}$  input
- (b) Explain Working Principle of Operation of three phase induction motor and compare squirrel cage induction motor with slip-ring induction motor.

**7. Attempt any one part of the following: 1x10=10**

- (a) Explain working principle of miniature circuit breaker (MCB) with the help of diagram and compare with ELCB.
- (b) Explain in detail different types of Insulation used in wire or cable.