CBCS SCHEME

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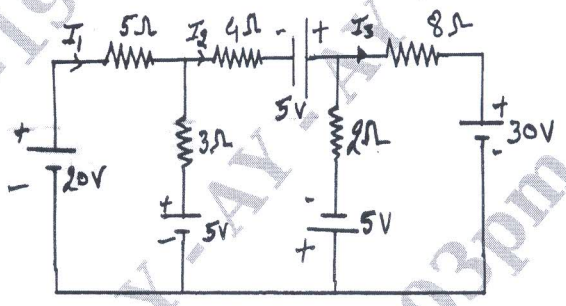
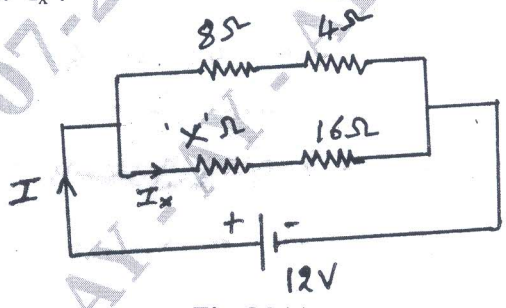
BESCK104B/ BESCKB104

# First Semester B.E./B.Tech. Degree Examination, June/July 2024
## Introduction to Electrical Engineering

Time: 3 hrs. Max. Marks: 100

***Note:*** *1. Answer any FIVE full questions, choosing ONE full question from each module.*
*2. M : Marks , L: Bloom's level , C: Course outcomes.*
*3. VTU databook is permitted.*

| | | Module – 1 | M | L | C |
|---|---|---|---|---|---|
| Q.1 | a. | Write the general structure of electrical power system using single line diagram approach and explain briefly. | 6 | L2 | CO1 |
| | b. | State ohm's law and mention its limitations. | 6 | L2 | CO1 |
| | c. | Find the currents $I_1$, $I_2$, $I_3$ for the circuit Fig Q1(c), shown below using Kirchoff's laws.   Fig Q1(c) | 8 | L3 | CO1 |
| | | **OR** | | | |
| Q.2 | a. | With a neat block diagram approach, explain Hydro-electric power plant. | 6 | L2 | CO1 |
| | b. | State Kirchoff's current and voltage law and write their the general mathematical expression. | 6 | L2 | CO1 |
| | c. | If the total power dissipated in the circuit Fig Q2(c), show below is 18W. Calculate the value of unknown resistance 'X' in ohms and the current flowing through it '$I_x$'.   Fig Q2(c) | 8 | L2 | CO2 |

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| | | **Module – 2** | | | |
| **Q.3** | **a.** | Define the following parameters with respect to ac sinusoidal waveform.<br>i) RMS value ii) Average value iii) Form factor iv) Peak factor. | **4** | **L2** | **CO1** |
| | **b.** | Explain the concept of generation of 3ϕ A.C voltages with neat waveforms. | **6** | **L2** | **CO2** |
| | **c.** | Write a neat diagram of pure inductive circuit supplies by A.C sinusoidal voltage and derive the relation between instantaneous voltage and current. Draw the relevant vector diagram. | **6** | **L3** | **CO2** |
| | **d.** | A balanced Y – connected load is supplied from a balanced 3ϕ, 400V, 50Hz system. The current in each phase is 30A and lags 30° behind the phase voltage. Find the phase voltage and total power. | **4** | **L3** | **CO2** |
| | | **OR** | | | |
| **Q.4** | **a.** | Define the following parameters with respect to a.c sinusoidal waveform :<br>i) Amplitude ii) Frequency<br>iii) Peak to Peak value iv) Instantaneous value. | **4** | **L2** | **CO1** |
| | **b.** | Write a neat circuit of resistance in series with capacitance supplied by A.C. sinusoidal voltage. Derive the expression for power consumed and write and relevant power wave forms. | **6** | **L3** | **CO2** |
| | **c.** | A series circuit with R = 10Ω, L = 50mH, C = 100μF is supplied with 200V, 50Hz, a.c supply. Calculate the i) impedance ii) Supply current iii) Power iv) Power factor of the circuit. | **6** | **L3** | **CO2** |
| | **d.** | Define power factor of an a.c circuit. Mention its significance in electrical systems. | **4** | **L2** | **CO2** |
| | | **Module – 3** | | | |
| **Q.5** | **a.** | With neat relevant diagram, explain the principle of operation of D.C motor. Briefly mention the significance of back. | **8** | **L2** | **CO3** |
| | **b.** | Derive an expression for induced emf of a D.C generator. | **6** | **L2** | **CO3** |
| | **c.** | A 4 pole D.C shunt motor takes 25A from 250Vsupply. The armature and field resistance are 0.5Ω and 125Ω respectively. The wave wound armature has 30 slots with 10conductors in each slot. If the flux per pole is 0.02wb. Calculate speed, torque developed and power developed in armature. | **6** | **L3** | **CO3** |
| | | **OR** | | | |
| **Q.6** | **a.** | With a neat sketch, explain the construction and main parts of D.C generator. Mention the function of each part and material used to manufacture them. | **8** | **L2** | **CO3** |
| | **b.** | Derive an expression for torque developed by a D.C motor. | **6** | **L3** | **CO3** |
| | **c.** | A 30kW, 300V, D.C shunt generator has armature and field resistance of 0.05Ω and 100Ω respectively. Calculate power developed by the armature when it delivers full output power. | **6** | **L3** | **CO3** |

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| | | **Module – 4** | | | |
| **Q.7** | **a.** | List the various losses in a transformer. Explain how they vary with the load. Give their equations and mention how they are minimized. | **8** | **L2** | **CO3** |
| | **b.** | Explain the construction of slip ring and squirrel cage type induction motor. | **6** | **L2** | **CO4** |
| | **c.** | An 8-pole alternator runs at 750rpm and it supplies power to 4 pole induction motor. The frequency of rotor is 1.5Hz. Calculate the speed of the motor and also slip of motor. | **6** | **L3** | **CO4** |
| | | **OR** | | | |
| **Q.8** | **a.** | A 600KVA transformer has an efficiency of 92% at full load, upf and at half load, 0.9p.f. Determine its efficiency at 75% of full load, 0.9p.f. | **8** | **L3** | **CO4** |
| | **b.** | A 250KVA, 11000/415V, 50Hz 1-ϕ transformer has 80 turns on secondary. Calculate :<br>i) The rated primary and secondary currents<br>ii) The number of primary turns<br>iii) The maximum value of flux<br>iv) Voltage induced per turn. | **6** | **L3** | **CO4** |
| | **c.** | Define slip of an induction motor. Derive an expression for effect of slip on the rotor frequency. | **6** | **L2** | **CO4** |
| | | **Module – 5** | | | |
| **Q.9** | **a.** | With neat sketch, explain the working principle of a fuse. Mention its merits and demerits. | **8** | **L2** | **CO5** |
| | **b.** | What is electric shock? Mention few safety precautions to avoid electric shocks. | **6** | **L2** | **CO5** |
| | **c.** | What is electricity tariff? Explain two part electricity tariff. | **6** | **L2** | **CO5** |
| | | **OR** | | | |
| **Q.10** | **a.** | With a neat circuit and switching table. Explain 3-ways control of load. Mention where it is applicable. | **8** | **L3** | **CO5** |
| | **b.** | What is earthing? With a neat diagram explain pipe earthing. | **6** | **L2** | **CO5** |
| | **c.** | Mention the power rating of the following electrical appliances.<br>i) Air conditioners<br>ii) Laptops<br>iii) LED tubelights<br>iv) Washing machines<br>Calculate the total power consumed by these four appliances. | **6** | **L4** | **CO5** |

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