Siddaganga Institute of Technology, Tumakuru-572 103
(An Autonomous Institution affiliated to VTU, Belagavi, Approved by AICTE, New Delhi)

Second Semester Bachelor of Engineering Examinations Sept. 2023

Introduction to Electrical Engineering

Time: 3 Hours   Max. Marks: 100

Note : 1. Revealing of Identity in any form in the answer book will be treated as malpractice.
        2. Answer any five questions choosing one full question from each unit.

Unit - I

			M	BL	CO	PO	PSO

1 a) What is conventional energy source and list them. State its advantages and disadvantages. — 6 | 1 | 1 | 1 | 1

b) Explain the working of Nuclear Power generation with the help of neat block diagram. — 7 | 1 | 1 | 1 | 1

c) Find the value of resistance 'R' for the circuit shown in Fig. 1(c), so that the current drawn from the source is 250mA. All the resistor values are in ohm.
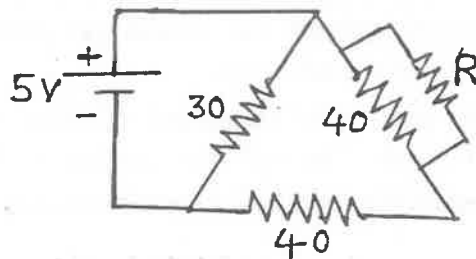

Fig. 1(c) — 7 | 2 | 1 | 1 | 1

OR

2 a) What is non-conventional energy source? Mention them with advantages and disadvantages. — 6 | 1 | 1 | 1 | 1

b) Explain the operation of Hydroelectric Power station with the help of a neat block diagram. — 7 | 1 | 1 | 1 | 1

c) A circuit consists of two parallel resistors having resistances of 20Ω and 30Ω respectively, connected is series with a 15Ω resistor. If the current through 15Ω resistor is 3A, Find
     i) The current in 20Ω and 30Ω resistors
     ii) The voltage across the whole circuit and
     iii) The total power consumes in all resistors — 7 | 2 | 1 | 1 | 1

Unit - II

3 a) Define i) Average value ii) RMS value and iii) Peak factor of an a.c quantity. — 6 | 1 | 2 | 1 | 1

b) A series circuit with a resistor of 100Ω, capacitor of $25\mu F$ and inductance of 0.15H is connected across 220V, 60Hz supply. Calculate:
     i) Current ii) Power iii) Power factor in the circuit — 6 | 2 | 2 | 1 | 1

c) There equal impedances, each having a resistance of 8Ω and inductive reactance of 6Ω are connected in i) star ii) delta across a 3 phase, 440 V system
Find i) Phase current ii) Line current iii) Total power consumed — 8 | 2 | 2 | 1 | 1

OR

4 a) From fundamentals prove that the average power consumed by pure inductance is zero. — 6 | 1 | 2 | 1 | 1

b) A current of average value 18.019A is flowing in a circuit to which a voltage of peak value 141.42V is applied. Determine
    i) The impedance in the polar form
    ii) The power. Assume that the voltage lags the current by 30°   6 2 2 1 1

c) A balanced delta connected 3 phase load is fed from a 3 phase, 400V supply. The line current is 20A and the total power absorbed by the load is 10KW. Calculate
    i)   The impedance in each branch
    ii) The power factor and
    iii) Total power consumed if the same impedance are star connected   8 2 2 1 1

Unit - III

5 a) With usual notations, derive the expression for indivisual emf in a d.c generator.   6 1 3 1 1

b) A 4 pole shunt generator with lap connected armature has armature and field resistance of 0.2Ω and 50Ω respectively. It supplies power to 100 lamps, each of 60 watts 200V. Calculate total armature current, the current per path and the generator emf. Allow a brush drop of 1volt at each brush.   6 2 3 1 1

c) A 500V shunt motor has 4 poles and wave connected winding with 492 conductors. The Flux per pole is 0.05wb. The full load current is 20A. The armature and shunt filed resistances are 0.1Ω and 250Ω respectively. Calculate the speed and developed torque.   8 2 3 1 1

OR

6 a) Derive an expression for armature torque developed in a d.c motor.   6 1 3 1 1

b) Explain the speed control of d.c shunt motor by field control method.   6 1 3 1 1

c) The armature of a 4 pole shunt motor has lap connected winding accommodated in 60 slots each containing 20 conductors, if the useful flux per pole is 23 mwb, calculate the total torque developed when the armature current is 50A.   8 2 3 1 1

Unit - IV

7 a) Derive an emf equation of a transformer.   6 1 4 1 1

b) A 250 KVA, 11000/415V, 50Hz single transformer has 80 turns on the secondary. Calculate
    i)   The rated primary and secondary current
    ii) The number of primary turns
    iii) The maximum value of Flux   6 2 4 1 1

c) Explain the concept of rotating magnetic field in an induction motor.   8 2 4 1 1

OR

8 a) Explain the various losses in a transfomer and how to minimize them? On what factors they depend?   6 1 4 1 1

b) A 600 KVA transformer has an efficiency of 92% at full load, unity power factor and at half load, 0.9 power factor. Determine its efficiency at 75% of full load, 0.9 power factor.   8 2 4 1 1

c) The frequency of the emf in the starter of 4 pole induction motor is 50 Hz and that of the rotor is 1.5 Hz. What is the slip and at what speed is the motor running?   6 2 4 1 1

Unit - V

9 a) Discuss the different types of wiring used for domestic purposes.   6 1 5 1 1

b) With a neat connection diagram and switching table, explain the two way and three way control of a lamp. 8 1 5 1 1

c) With a neat diagram, explain pipe earthing. 6 1 5 1 1

OR

10 a) Explain the necessity of earthing for electrical equipment's. 4 1 5 1 1

b) Discuss two-part electricity tariff and an electric boiler draws 12A current at 115V for a period of 6 hours. If electrical energy costs Rs. 2.5 per kwh, determine the cost of the boiler operation. 6 1 5 1 1

c) What is the purpose of using fuse or MCB in an electrical installation? 4 1 5 1 1

d) State the factors on which severity of the shock depends and also write the precautionary measures taken against electric shock. 6 1 5 1 1