Sr. No. 321304

December 2023

B.Sc.(H) Physics Semester-III

Electrical Circuits and Network Skills (SECP-02A)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*
4. *Use of non-programmable scientific calculator is allowed.*

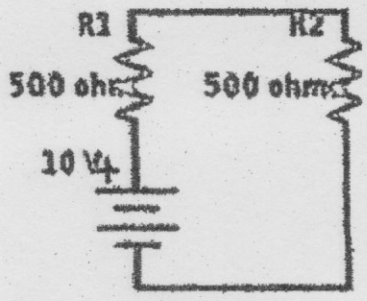
PART -A

Q1 (a) Calculate the total inductance of three inductors of 10 mH, 40mH, and 50mH, with no mutual inductance, are connected together in: (i) Series combination, (ii) Parallel combination. (1.5)

(b) Give one example each of the electrical components which obey and disobey Ohm's Law. (1.5)

(c) Define power factor. What is power factor of an ideal source? (1.5)

(d) Find the voltage across resistance R1 in the circuit below. (1.5)



(e) Draw electric symbols for fixed capacitor, polarized capacitor and variable capacitor. (1.5)

(f) How the capacitor and Inductor respond when connected to ac and dc sources. (1.5)

(g) Write two differences between AC and DC generators. (1.5)

(h) An alternating voltage (6 + 4j) V is applied to a series ac circuit and the current flowing is (-3 + 4j). Find the impedance. (1.5)

(i) Discuss the working principle of a transformer. (1.5)

(j) What is a fuse? (1.5)

PART -B

Q2 (a) Explain with the help of relevant circuit diagram, how an analog multimeter can be used as a dc ammeter and ohm meter. How can a multimeter be used to test a diode? (10)

(b) Define Average value, peak value and RMS value of ac signal. Calculate these parameters for ac mains (sine wave) of frequency 50Hz and RMS value of 220 V. (5)

Q3 (a) Explain the role of an ammeter, a voltmeter and a galvanometer in DC and AC circuits and Explain the advantages and disadvantages of a multimeter. (10)

(b) Discuss any two DC power sources. (5)

Q4 (a) Describe the construction and working of a dc generator. Support your answer with relevant diagrams. (10)

(b) List and explain the different kind of losses that occur in a dc generator. (5)

Q5 (a) Discuss the basic design and working of a single phase motor. What are the advantages of a polyphase motor? (10)

(b) Define speed of an ac motor. What does it depend on? (5)

Q6 (a) Explain color coding in carbon resistors with example. What is the meaning of tolerance in resistors? Write two colors that are often used in color coded resistors to represents tolerance and what values do these represent? (7)

(b) Describe the construction and working of a step-down transformer with diagram. (8)

Q7 Short note on the followings: (15)
(i) Preparation of extension board, (ii) Ground-fault protection, (iii) Fuses and disconnect switches.

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