SUMMER-2024	
Exam Seat No.:	
Academic Year:2023-2024	Semester:I/II
Class: FY (All Branches)	Program:B.Tech
Branch Code:FYE	Pattern:2022
Name of Course:Fundamentals of Electrical Engineering	Course Code:FYE221006
Max. Marks:60	Duration:2.30 Hrs.

Instructions: Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 03 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

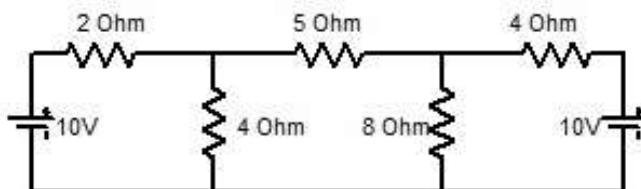**Question No. 1 Attempt following Question**

1a) Derive the formula for insulation resistance of a single cable.   (6)   CO1

OR

State and explain Thevenin's theorem.

Question No. 2 Attempt following Question

2a) Use KVL to calculate current through 5 Ohm Resistance   (6)   CO4

OR

An electric kettle is used to heat 5 liter of water in 1 min from 20 degree C to 60 degree C. If efficiency of kettle is 90%, then what is power rating of the kettle. Take specific heat capacity of water as 4186 J/kgK.

Question No. 3 Attempt following Question

3a)   A single phase AC supply is connected across pure capacitance of C Farad.   (8)   CO4

     (i) Draw the circuit diagram. **(1 Marks)**

     (ii) Derive the equation of instantaneous current. **(2 Marks)**

     (iii) Draw waveform and phasor diagrams. **(2 Marks)**

     (iv) Derive the equation of average power. **(3 Marks)**

<p align="center">OR</p>

3b)   Define rms value of an alternating current and show that rms value of the current is 0.707 time of   (8)   CO4
maximum value of the sinusoidal current.

3c)   The instantaneous value of the voltage is given by $v = 100\sin314.16t$. Calculate   (8)   CO4

     (i) rms value of the voltage. **(1 Mark)**

     (ii) frequency of the supply. **(2 Mark)**

     (iii) value of the instantaneous voltage at 2.5msec. **(2 Mark)**

     (iv) the time at which instantaneous voltage is -100V **(3 Mark)**

<p align="center">OR</p>

3d)   A series combination resistance of 10 Ohm, inductance of 10mH and capacitance of 100 micro   (8)   CO4
Farad is connected across 230V, 50Hz single phase AC supply. Calculate

     (i) Inductive and capacitive reactance **(2 Mark)**

     (ii) Impedance **(2 Mark)**

     (iii) Current **(2Mark)**

     (vi) Active and reactive power **(2 Mark)**

Question No. 4 Attempt following Question

4a)   Classification of MCB based on characteristic with its applications. Compare it with fuse.   (8)   CO5

<p align="center">OR</p>

4b)   What is the necessity of earthing system? Which type of earthing you will use at home? What are its   (8)   CO5
merits and demerits? What is the role of charcoal and salt in earthing system?

4c)   A star connected RL load is connected across three phase AC supply.   (8)   CO4

     (i) Draw the diagram **(2 Marks)**

     (ii) Draw the phasor diagram **(3 Marks)**

     (iii) Derive the relation between line and phase quantitates **(3 Marks)**

<p align="center">OR</p>

4d) A delta connected load of impedance (20+j30) ohm/phase is connected across three phase 400V, 50Hz AC supply.　　(8)　CO4

(i) Line and phase voltage **(2 Marks)**

(ii) Line and phase current **(3 Marks)**

(iii) Active, reactive and apparent power **(3 Marks)**

Question No. 5 Attempt following Question

5a) What are the types of stepper motors? Explain any one with diagram.　　(8)　CO3

OR

5b) Draw the construction diagram of core type of transformer with labelling. Explain all parts in details.　　(8)　CO3

5c) A transformer 2kVA, 100V/400V secondary winding have 500 turns. calculate　　(8)　CO3

(i) Full load current of primary and secondary **(3 Marks)**

(ii) Number of turns on secondary **(2 Marks)**

(iii) Full load Copper loss if resistance of primary and secondary winding is 0.2 ohm and 2 ohm respectively. **(3 Marks)**

OR

5d) In 20kVA, 1000V/250V transformer, the iron and full load copper losses are 300W and 400W respectively. Calculate　　(8)　CO6

(i) Efficiency at full load unity power factor lagging **(4 marks)**

(ii) The load at which efficiency of transformer is maximum **(2 marks)**

(ii)The maximum efficiency of transformer at unity power factor **(2 marks)**

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