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Name of Examination : **Summer 2021** - (Preview)

Course Code & Course Name : **EE101U - Elements of Electrical Engineering**

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Maximum Marks : **60**

Duration : **3 Hrs**

[Edit](#) [Print](#) [View Answer Key](#) [Close](#) **Answer Key Submission Type:** Marking scheme with model answers and solutions of numerical

Instructions:

1. All questions are compulsory.
2. Illustrate your answer with suitable figures/sketches wherever necessary.
3. Assume suitable additional data; if required.
4. Use of logarithmic table, drawing instruments and non programmable calculators is allowed.
5. Figures to the right indicate full marks.

- 1) Solve any **two** sub questions:
 - a) State the characteristics of series circuit and explain how it works as voltage divider. [6]
 - b) Transform a voltage source of 50 V with an internal resistance of $10\ \Omega$ to a current source a current source of 5A with internal resistance of 20 ohms to voltage source. [6]
 - c) Explain working principle of fluorescent lamp with neat sketch. [6]
- 2) Solve any **two** sub questions:
 - a) Define the following: [6]
 - (i) Average value and RMS value
 - (ii) Find out the resistance and inductance for (i) $(6+j8)\ \Omega$, 2) $25\angle 45^\circ\ \Omega$, if the frequency is 50 Hz.
 - b) State and prove the relation between line voltage and phase voltage, line current and phase current for three-phase delta connected circuit. [6]

A current of 5A flows through a non-inductive resistance in series with choke coil when supplied at 250V, 50Hz. If the voltage across resistance is 125V and across choke coil is 200V. Calculate resistance and reactance of choke coil and active power consumed by total circuit and choke coil.
- 3) Solve any **two** sub questions:
 - a) Explain eddy current losses and the factors on which it depends. [6]
 - b) Describe self-inductance and state factors affecting on it. [6]
 - c) A circular iron ring having cross section 10 cm^2 and length of $(4\pi)\text{ cm}$ has an air gap of $(0.4\pi)\text{ mm}$ made by saw cut. The relative permeability of iron is 10^3 and permeability of free space is $4\pi \times 10^{-7}\text{ H/m}$. The ring is wound with a coil having 2000 turns and carries 2 mA current. Determine the air gap flux neglecting leakage and fringing. [6]
- 4) Solve the following sub-questions:
 - a) A resistance of 20 ohms and inductance of 0.2 H and capacitance of $100\ \mu\text{F}$ are connected in series across 220V, 50Hz, mains. Determine impedance of the circuit, voltage across R, L and C, current drawn by circuit, active and apparent power, power factor and its nature. [6]
 - b) Derive an EMF equation of single phase transformer and explain voltage ratio and current ratio of transformer. [6]
- 5) Solve the following sub-questions:
 - a) A battery having an emf of 110V with internal resistance of 0.2 ohms is connected in parallel with another battery having of 100V and internal resistance of 0.25 ohms. These two in parallel are placed in series with a resistance of 5 ohms and this combination is connected across 220V mains. Calculate the magnitude and direction of the current in each battery and total current from mains supply. [6]
 - b) A transformer is rated at 100 kVA. At full load, its copper loss is 1200 W and iron loss is 960 W. Calculate the efficiency at full load and half load at unity power factor and 0.8 lagging pf. Determine the loading condition for which efficiency is maximum and loading of transformer in kVA. [6]

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