



ELIZADE UNIVERSITY ILARA MOKIN, ONDO STATE

FACULTY OF ENGINEERING

**DEPARTMENT OF ELECTRICAL AND
COMPUTER ENGINEERING**

SECOND SEMESTER EXAMINATION, 2017/2018 ACADEMIC SESSION

COURSE TITLE: BASIC ELECTRICAL ENGINEERING II

COURSE CODE: GNE 228

EXAMINATION DATE: 7th AUGUST 2018

COURSE LECTURER: DR K. O. TEMIKOTAN

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HOD's Signature

TIME ALLOWED: 2 HOURS 30 MINUTES

INSTRUCTION

- 1. ANSWER ANY FIVE QUESTIONS**
- 2. SEVERE PENALTIES APPLY FOR MISCONDUCT, CHEATING, POSSESSION OF UNAUTHORIZED MATERIALS DURING EXAM.**
- 3. YOU ARE NOT ALLOWED TO BORROW ANY WRITING MATERIALS DURING THE EXAMINATION.**

QUESTION ONE

- Explain the condition for resonance for an RLC series circuit. (4 marks)
- Find the resonant frequency of a series AC circuit consisting of a coil of resistance 12Ω and inductance 60mH and capacitance $0.05\mu\text{F}$. Find the current flowing at resonance if the supply voltage is 120V . (4 marks)
- A filter in the form of a series $L-R-C$ circuit is designed to operate at a resonant frequency of 5kHz . Included within the filter is a 24mH inductance and 10.6Ω resistance. Determine the bandwidth of the filter. (4 marks)

QUESTION TWO

- Explain the following terms: Q-factor, Bandwidth, and Selectivity in an RLC circuit. (5.5 marks)
- State the condition for resonance for an RLC parallel circuit (1.5 marks)
- A coil of resistance 28Ω and inductance 120mH is connected in series with a capacitance of $0.15\mu\text{F}$ across a 220V variable frequency supply. Calculate (i) the resonant frequency, (ii) the current at resonance and (iii) the factor by which the voltage across the reactance is greater than the supply voltage (iv) Draw the phasor diagram of the circuit. (8 marks)

QUESTION THREE

A 220V , 50Hz single-phase supply feeds the following loads: (i) fluorescent lamps taking a current of 8.4A at a power factor of 0.8 leading, (ii) incandescent lamps taking a current of 5.8A at unity power factor, (iii) a motor taking a current of 14.6A at a power factor of 0.72 lagging.

- Determine the total current taken from the supply and the overall power factor. (7 marks)
- Find the value of a static capacitor connected in parallel with the loads to improve the overall power factor to 0.97 lagging. (4 marks)
- Draw the overall phasor diagram of the circuit after power factor correction (4 marks)

QUESTION FOUR

- Write out the various expressions for determining the reluctance S of a magnetic circuit in terms of the magnetomotive force, magnetic flux, flux density, and the dimensions of the circuit. (4 marks)
- In the Figure 1, find the current, I in the coil needed to produce a flux of 0.45mWb in the air gap. The silicon iron magnetic circuit has a uniform cross-sectional area of 3cm^2 , magnetic flux density 1.5Tesla and Magnetic field strength 3500At/m (8 marks)

QUESTION FIVE

- A current has the following steady values in Amperes for equal intervals of time changing simultaneously from one value to the next.
 $0, 10, 20, 30, 20, 10, 0, -10, -20, -30, -20, -10, 0, \dots$
Calculate (i) the average value (ii) effective value (iii) form factor and (iv) peak factor. (6marks)
- Two currents are given by the expressions;

$$i_1 = 10 \sin\left(314t + \frac{\pi}{4}\right) \quad i_2 = 8 \sin\left(314t - \frac{\pi}{3}\right)$$

Find $i_t = i_1 + i_2$

(6 marks)

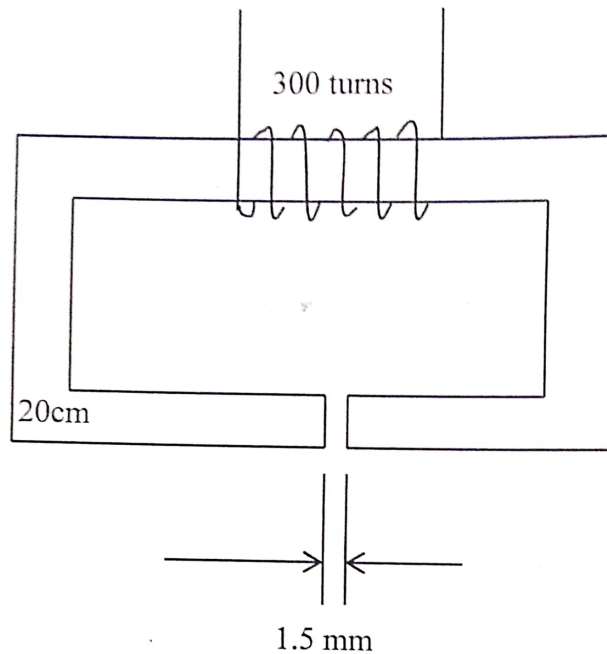


Figure 1: Question 4b

QUESTION SIX

- An 8-pole generator has a lap-wound armature with 50 slots with 20 conductors per slot. The useful flux per pole is 24 mWb. Determine the speed at which the machine must be driven to generate an e.m.f. of 240 V
(6 marks)
- A 25-kVA transformer has 500 turns in the primary winding and 40 turns in the secondary winding. The primary is connected to a 3000, 50 Hz supply. Neglecting losses, calculate (i) the primary and secondary currents on full load, (ii) secondary emf, and (iii) the maximum flux in the core.
(6 marks)

QUESTION SEVEN

- A permanent magnet coil moving coil instrument gives full reading of 25 mA when a potential difference across the terminals is 75 mV. How can it be used (i) as an ammeter for a range 0 – 100 A? (ii) as a voltmeter 0 – 750 V range?
(6marks)
- Using neat diagrams show the difference between an open loop control system and a closed loop control system. What are the advantages of closed loop control system over the open loop system?
(6 marks)