FNU FIJI NATIONAL UNIVERSITY

COLLEGE: COLLEGE OF ENGINEERING, SCIENCE & TECHNOLOGY (CEST)

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: TRADE DIPLOMA IN ELECTRICAL/ELECTRONIC ENGINEERING

UNIT CODE: EEE467

TITLE: ELECTRICAL PRINCIPLES

FINAL EXAMINATION --- TRIMESTER 3, 2018

ROOM: AS PER TIMETABLE ----TIME---3HRS, 10 MIN

Total Marks: 100%

INSTRUCTIONS TO STUDENTS

1. You are allowed **10 minutes** extra **reading time** during which you are **NOT** to write.
2. Begin each SECTION on a fresh page and use both sides of the sheet.
3. Write your candidate number at the top of each attached sheet.
4. Insert all written foolscaps, graph paper, drawing paper, etc. in their correct sequence and secure with a string.
5. For all sheets of paper on which rough/draft work has been done, cross it through and ATTACH these to your answer scripts.
6. Write clearly the number(s) of the question(s) attempted on the top of each sheet.
7. Use of programmable calculator(s) is prohibited.
8. **ANSWER ALL QUESTIONS**
9. Show all working where necessary.

SECTION A----------20 MARKS

1. Show with diagram how voltage is created in a magnetic field (4 marks)

2. Explain in detail what iron loss is with an example? (4 marks)

3. Explain two ways in which alternator emf can be increased (2 marks)

4. A conductor 0.3m long is rotating on the periphery of an armature at 24m/s. If the flux density is 0.4T, calculate the maximum voltage induced in the conductor, and the voltage when the conductor is cutting the magnetic field at an angle of 90°, 60° and 45°

(6marks)

5. Calculate the voltage generated by a 160mm conductor passing through a 2 tesla field at 3m/s at an angle of 60°

(4marks)

SECTION B----------40 MARKS

1. The instantaneous value in an ac sinusoidal waveform is given by I = 30 sine ϕ. For the angle ϕ between values 0°, 90°, 180°, 270°, 360°sketch the waveform;

   a) Indicate the r.m.s value
   b) Indicate the average value (3 marks)

2. What is the phase relationship between V and I in the circuits?

   a) Purely Resistive (3 marks)
   b) Purely Capacitive
   c) Purely Inductive

3. A series resonant circuit consists of a 50 Ω resister, 0.1 H inductor and a 0.2μF capacitor is connected in series across a 100V supply.

   a) Calculate the frequency supply at resonance
   b) What is the impedance value at resonance
   c) Calculate the current at resonance
   d) Determine the power factor (4 marks)

4. A series RLC is connected to a 50 Hz, 240V supply. Calculate the value of the Capacitor in μF to achieve resonance if R= 60 Ω & L= 120 mH (3marks)

5. A resistor of 8Ω and an inductor of 0.12H are connected in parallel to a 240V, 50Hz supply. Calculate:

   a) The current flowing in the resistor (1 mark)
   b) The current flowing in the inductor (1 mark)
   c) The total current supply (1 mark)
   d) The total impedance of the circuit (1 mark)
   e) The Power factor (1 mark)

6. Explain what series resonance and parallel resonance circuit are.

   (2marks)

7. Give one danger if resonance occurs in electrical installation.

   (1mark)

8. Explain why A.C machines are rated in K.V.A and not in K.W. (3 marks)

9. Give four serious effects of low power factor on A.C supply system. (4 marks)

10. Give two advantages of power factor improvement. (2 marks)

11. A welding plant set draws 30A from a 400V AC supply at a pf of 0.5 lagging. Calculate:

    a) the kVA of the plant
    b) the power in kW (2 marks)

12. The power being supplied to a factory is 1000kW and apparent power is 1200kVA, calculate the power factor. (2 marks)

13. If a 1Kw load is connected to a 250 V a.c supply, find the current flowing at:

    a) The power factor is 0.8
    b) The power factor is 0.4
    c) The power factor is unity (3 marks)

14. When connected to a three phase motor, two wattmeter's gave readings of 5 kW, and -1 kW, Calculate
    a) Total power
    b) Power factor, assuming balance load. (3 marks)

SECTION C----------40 MARKS

1. Draw the three phase wave form from 0 – 360 degrees. (4 marks)

2. Compare the two types of three phase connections. Mention at least five (5) points in each case. (5 marks)

3. Give two functions of neutral conductor in a three phase four wire system. (2 marks)

4. Three loads, each of resistance 30*ohms,* are connected in star to a 415V, 3-phase supply

   Determine (a) the system phase voltage,
   (b) the phase current and
   (c) the line current. (6marks)

5. Three identical coils, each with resistance of 12 ohms and inductance of 38mH are connected in star to a 415 volts 50 hertz three phase supply, calculate
   a) Inductive reactance of each coil
   b) Impedance of each phase
   c) Phase current
   d) Line current (5 marks)

6. Define transformer and also state its usefulness. (3 marks)

7. Three factors are required for the production of voltage in a transformer, state these three factors. (3 marks)

8. Define an ideal transformer? (2 marks)

9. State with aid of diagrams, the circuit connections of a three phase star-delta transformer. (2 marks)

10. State and specify the two different methods of cooling transformers. (3 marks)

11. 240V is applied to the primary windings of a transformer having 1100 turns. If the secondary has 900 turns calculate the secondary voltage. (2 marks)

12. Determine the total copper loss of a transformer on full-load having secondary and primary currents of 100A and 20A respectively. (Winding resistance: secondary = 0.02Ω; primary = 0.05Ω) (3 marks)

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