FNU FIJI NATIONAL UNIVERSITY

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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: TRADE DIPLOMA IN ELECTRICAL ENGINEERING - STAGE 2

UNIT CODE: EEE431

TITLE: ELECTRICAL PRINCIPLES 2B

FINAL EXAMINATION – SEMESTER 2, 2015

ROOM: AS PER TIMETABLE
TIME: 2 HOURS 10 MINUTES

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.

10. **ALWAYS CHECK YOUR WORK BEFORE YOU LEAVE THE EXAM ROOM.**

1) The power input to a 400/230V three phase induction motor is measured by the two wattmeter method. The wattmeter's show readings of 13.5kW and 7.5kW, both positive. Calculate the line current, power input and the power factor of the motor.   **(5 marks)**

2) Explain in detail what iron loss is with an example?   **(3 marks)**

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

4) List three effects of low power factor.   **(3 marks)**

5) An inductor plus resistor, capacitor and resistor are all connected in parallel with the following values (0.25H & 10 Ω), 80μF and 20 Ω across a 415V, 50Hz supply. Find the impedance of the circuit and its phase angle.   **(5 marks)**

6) An inductor of 0.2H, and a capacitor of 60μF are all connected in parallel across a 120V, 60Hz supply. Find the total impedance and the phase angle.   **(6 marks)**

7) A resistor 20Ω, inductor 0.12H and capacitor 10μF are all connected in series across a 240V 50Hz supply. Find the voltage drop across each component and the total current.   **(7 marks)**

8) An alternator is capable of supplying 10KVA through a 415 V 50Hz supply at power factor of 0.9. Find the efficiency of the alternator given a copper and iron loss of 150W and 300W respectively.   **(4 marks)**

9) Name the three types of transformer.   **(3 marks)**

10) A transformer having a power factor of 0.9 has the following readings stated below. From this find the efficiency and the primary current of the load.
    -   Output voltage 20V and current15A
    -   Copper losses of 50W
    -   Iron losses of 50W
    -   Transformer load 15Ω **(5 marks)**

11) What rating of capacitor is required to improve the power factor to 0.85 lagging given a motor draws 10A at 0.7 power factor lagging. The system is connected across a 240V, 50Hz supply.
                                    (6 marks)
12) Explain why a three phase system is better than any other voltage supply.   **(2 marks)**

13) What are the advantages of using a three phase system over single phase.   **(4 marks)**

14) What is the purpose of using a neutral conductor in an unbalanced system.   **(2 marks)**

15) Find the neutral current in a three phase system if red current is 120A at 0.8 lagging, blue current is 100A at 0.85 lagging and white current is 100A at 0.9 lagging. Use supply as 415V, 50Hz. (6 marks)

16) A three phase 415V, 50Hz star connected system is connected across three resistors of values 5Ω, 10Ω and 15Ω respectively. Each resistor is connected across each phase. Find
      i.   each of the phase current (4 marks)
      ii.   total power consumed by the system (6 marks)

17) Describe the operating principle of a transformer. (2 marks)

18) Draw a diagram showing how copper losses are measured in a transformer. (4 marks)

19) A delta connected three phase transformer of 415V, 50Hz supply has 100 turns on primary winding and 600 turns on secondary winding. Find the output phase voltage and the output phase current if the output is connected to a delta load. (6 marks)

20) How does a PT works and give examples of this. (2 marks)

21) Explain the relationship between the voltages and number of turns of the two windings of a transformer. (2 marks)

22) What is meant by the term leakage flux and how is it kept to a minimum? (4 marks)

23) Describe the phase shifts of the four main transformer connections. (6 marks)

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