FNU FIJI NATIONAL UNIVERSITY

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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME: CERTIFICATE IV IN ELECTRICAL ENGINEERING-STAGE 5

UNIT CODE: EEE451

TITLE: ELECTRICAL MEASUREMENTS AND MACHINES

FINAL EXAMINATION – PENSTER 5, 2013

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.**

SECTION A   (40 MARKS)

1. What is a transformer and also state its usefulness.   (3 marks)

2. List down three safe working procedures for current transformers and potential transformers.

    (6 marks)

3. What is the purpose of having tap changers on transformers?

    (4 marks)

4. What are the advisable colors to be used on a transformer tank and state the reason for using the indicated colors?

    (4 marks)

5. What is an ideal transformer?   (3 marks)

6. Draw and label clearly the equivalent circuit of a transformer.

    (3 marks)

7. List the names of four different types of three phase transformer cores.

    (4 marks)

8. Explain the relationship between the voltage and the number of turns of the two windings in a transformer.   (3 marks)

9. State the three requirements for connecting a transformer in parallel and explain the effects of each.   (6 marks)

10. Name and explain the two different methods of cooling transformers.

    (4 marks)

SECTION B   (30 MARKS)

1. Name two types of instrument transformers and state the reason for their use.
(4 marks)

2. List three basic factors by which alternators are rated.   (3 marks)

3. State the two main windings of an alternator, and specify where the two windings can be found in an alternator.
(4 marks)

4. State the primary purpose of connecting two alternators in parallel.
(2 marks)

5. Briefly describe what happens when two alternators with a fixed load and power factor has an increase in excitation.
(4 marks)

6. The secondary circuit of a transformer must never be opened when current is flowing in the primary. Briefly explain what could happen if this occurs.
(3 marks)

7. Draw and label clearly:

   (i)   A basic alternator circuit   (5 marks)

   (ii) A block diagram for an engine-driven standby alternator. (5 marks)

SECTION C   (30 MARKS)

1. 240V is applied to the primary windings of a transformer having 1100 turns. If the secondary has 900 turns calculate the secondary voltage.

                                                                              (4 marks)

2. The maximum flux of a 50Hz transformer is 0.001Wb. If the primary is wound with 1080 turns, find the applied primary voltage and then calculate the number of turns required for a 15V secondary.

                                                                              (6 marks)

3. The 110V output of a transformer is applied to a 22Ω resistive circuit, causing 0.22Amps to flow in the primary winding. Calculate the primary voltage.

                                                                              (5 marks)

4. 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)

                                                                              (6 marks)

5. At what speed would the governor of a 12 pole diesel driven alternator have to set to establish a frequency of 50Hz.

                                                                              (3 marks)

6. Determine the:
    (i)   Generated phase voltage of a 50kVA, 50Hz alternator with 350 conductors per phase, flux = 0.0038Wb, distribution constant = 0.9, and coil pitch constant = 0.93.

                                                                              (3 marks)

    (ii) Voltage regulation if the output on load is 240V.   (3 marks)

                            THE END

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