FIJI NATIONAL UNIVERSITY

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

SCHOOL: SCHOOL OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAMME:TRADE DIPLOMA IN ELECTRICAL/ELECTRONIC ENGINEERING - STAGE 3

UNIT CODE: EEE467

TITLE: ELECTRICAL PRINCIPLES

FINAL EXAMINATION --- TRIMESTER 3, 2016

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----------15 MARKS

1. Explain in detail what copper loss is with an example? (3 marks)

2. State how voltage is created in a magnetic field (3 marks)

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

4. A conductor 0.5m long is rotating on the periphery of an armature at 25m/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°

(4marks)

5. Calculate the voltage generated by a 180mm conductor passing through a 3 tesla field at 4m/s at an angle of 60°

(3marks)

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

1. The instantaneous value in an ac sinusoidal waveform is given by I = 40 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
   c) Peak value (3 marks)

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

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

3. 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)

4. A coil of inductance 318.3mH and negligible resistance is connected in series with a 200Ω resistor to a 240V, 50 Hz supply. Calculate
   (a) the inductive reactance of the coil, (1 mark)
   (b) the impedance of the circuit, (1 mark)
   (c) the current in the circuit, (1 mark)
   (d) the p.d. across each component, and (1 mark)
   (e) the circuit phase angle. (1 mark)

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

   (2marks)

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

   (1mark)

7. Explain why A.C machines are rated in K.V.A and not in K.W. (2 marks)

8. Give four serious effects of low power factor on A.C supply system. (2 marks)

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

10. A welding plant set draws 40A from a 400V AC supply at a pf of 0.5 lagging. Calculate:

    a) the kVA of the plant
    b) the power in kW (3 marks)

11. The power being supplied to a factory is 1060kW and apparent power is 1200KVA, calculate the power factor. (2 marks)

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

    a) The power factor is 0.9
    b) The power factor is 0.45
    c) The power factor is unity (3 marks)

13. 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)

14. Factory installation has the following loads:
    - Incandescent lamps- 10kW
    - Heater - 30kW
    - Motor - 40Kva at p.f. of 0.8 lagging

    a. Calculate the total active load in kW.
    b. Calculate the total kVAr
    c. Calculate the total kVA
    d. d) Calculate the p.f. of the installation

(4marks)

SECTION C----------45 MARKS

1. Explain the terms real power, apparent power and reactive power for ac circuits and also the units used. (4 marks)

2. List down five advantages of three phase connection. (5 marks)

3. Name two types of three phase connection (2 marks)

4. Draw the typical arrangement setup for generation, transmission and distribution of three phase electrical power supply. (4 marks)

5. Draw the three wattmeters (three wire system) and give its advantages and disadvantages. (4 marks)

6. Draw the three phase wave form from 0 – 360 degrees. (2 marks)

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

8. 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. (3marks)

9. 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 (3 marks)

d) Line current (5 marks)

10. Define transformer and also state its usefulness. (2 marks)

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

12. Define an ideal transformer? (2 marks)

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

14. State and specify the two different methods of cooling transformers. (2 marks)

15. 250V is applied to the primary windings of a transformer having 1100 turns. If the secondary has 800 turns calculate the secondary voltage. (2 marks)

16. 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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