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University Examinations 2013/2014

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL
ENGINEERING

EEE 0221: ELECTRICAL ENGINEERING PRINCIPLES III

DATE: APRIL 2014

TIME: 1 ½ HOURS

INSTRUCTIONS: Answer question *one* and any other *two* questions

QUESTION ONE – (30 MARKS)

- (a) Define the term transformer. (1 Mark)
- (b) Explain briefly the working principle of basic transformer. (5 Marks)
- (c) A 100KV, 6600/400V, 50HZ single phase transformer has 60 runs on the secondary windings. Calculate
 - (i) Approximate number of primary runs (2 Marks)
 - (ii) The maximum value of flux (3 Marks)
- (d) Explain briefly three energy losses in a transformer. (3 Marks)
- (e) A three phase transformer has 500 primary turns and 200 secondary turns. If the supply voltage is 2.5KV, determine the secondary line voltage on no load when the windings are connected.
 - (i) Delta – star (3 Marks)
 - (ii) Star – delta (3 Marks)
- (f) Define the following terms as applied to illumination
 - (i) Steradian (1 Mark)
 - (ii) Lamp efficiency (1 Mark)
- (g) A drawing office containing a number of boards and having a total effective area of 70m² is lit by a number of 400W Lamps giving 11lm/W. An illumination of 80 lux is required on the drawing boards. Assuming that 60% of the total light emitted by lamps is available for illumination of the drawing boards, estimate the number of lamps required. (5 Marks)

- (h) State three properties of a well designed lighting scheme. (3 Marks)

QUESTION TWO – (15 MARKS)

- (a) State three factors that determine the utilization coefficient. (3 Marks)
- (b) A 200KVA transformer has a primary winding resistance of 0.3Ω and a secondary winding resistance of 0.0015Ω . The iron loss is 150W and the primary and secondary voltages are 4KV and 500V respectively. If the power factor of the load is 0.85, determine
- (i) The primary current (1 Mark)
 - (ii) The secondary current (1 Mark)
 - (iii) The efficiency of the transformer
 - I. On full load (5 Marks)
 - II. On half load (5 Marks)

QUESTION THREE – (15 MARKS)

- (a) Explain five types of lighting schemes. (5 Marks)
- (b) A hall is to be provided with a lighting installation. The hall is $30m \times 20m \times 8m$ (height). The mounting height is 5m and the required level of illumination is 110 lux. Assume:
- Utilization coefficient = 0.6
 - Maintenance factor = 0.8
 - Space/height ratio = 1
 - Lumens / watt for 300W lamp = 12
 - Lumens / watt for 500 – W lamp = 11.6

Using filament lamps estimate the size and number of single lamp luminaries required.

- (4 Marks)
- (c) A lamp giving out 5700 lumens is suspended 5m above the horizontal plane
- (i) Directly below the lamp. (3 Marks)
 - (ii) 12 m away from the vertical axis. (3 Marks)

QUESTION FOUR – (15 MARKS)

- (a) A 2200/400V single phase transformer takes a no load current of 0.5A and the core loss is 400W. determine
- (i) The value of working current. (2 Marks)

- (ii) The value of magnetizing current. (2 Marks)
- (iii) Power factor of the transformer. (2 Marks)
- (iv) Draw the no-load phasor diagram for the transformer. (2 Marks)
- (b) A single phase transformer has 2000 turns on the primary and 800 turns on the secondary windings. Its no-load current is 5A at a power factor of 0.2 lagging. Assume the voltage drop in the windings is negligible, determine the primary current and power factor when the secondary current is 120A at a power factor of 0.80 lagging. (8 Marks)