Notre Dame University
EEN 457, Electrical Installation

Name: [redacted]

78/100

Midterm Exam

Tuesday May 5, 2009

60 minutes, Closed Books

A. **Comprehensive Part (40 points)**

1. Draw an electrical diagram showing the connection between an MV/LV transformer and a distribution panel, considering TT earthing system.

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2. Give three emergency loads Examples:

   - Exit Alarms
   - Power Generation set not a load.
   - UPS (charger)

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3. What is TR in the following Motor Starter?

it is the timer + contactor.

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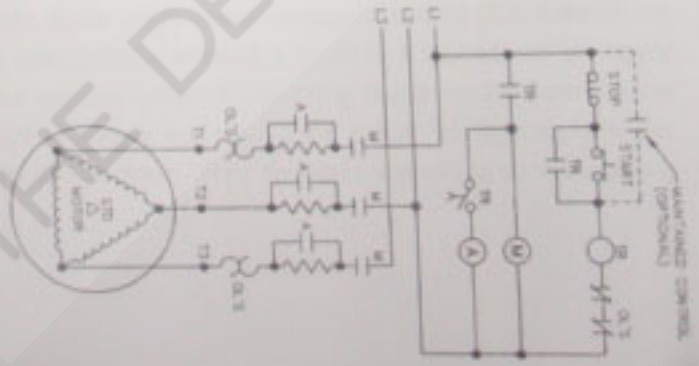


4. The following expression is used to calculate what?

$\Delta U = 2 \, Le \, I \, (R \cos\alpha + L \, W \sin\alpha)$

8 it is used to calculate the drop of voltage in a single phase

5. In the previous expression what are the following parameters and what units are used for each one:

Le : length

I : current

5 R: Resistance

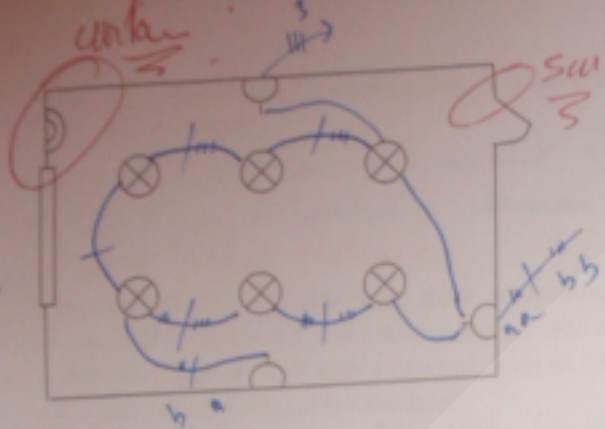
L: inductance

W: radial frequency

α: angle between U & I

B. Exercises (60 points):

a) A room is lighten by means of 6 luminaires of 60 W each with a PF = 0.9. The light switch is closed to the door. Three single phase receptacles plugs (1.5 A each) are installed in the room and one electrical point of 1 A/phase is considered to supply the three phase driver for a window curtain. Considering that 3 circuits from a same distribution panel are used to supply the room (one circuit for lighting, one for receptacles and one for the curtain driver, Draw the electrical wiring on the drawing below:



b) Three rooms similar to the one previously described are used in a building. These rooms are supplied from a three phase 220V electrical panel with a capacity of sixteen single or three phase circuits.
Fill the following schedule for the panel:

Load Description	Circuit No	Phase kVA 1	Phase kVA 2	Phase kVA 3	Circuit No	Load Description
Lighting	1	0,4			2	lighting
lighting	3	0,4			4	receptacles
receptacles	5	990			6	receptacles
receptacles	7	990			8	receptacles
receptacles	9	990			10	receptacles
receptacles	11	990			12	receptacles
Curtain Driver	13			660	14	Curtain Driver
Curtain Driver	15			660	16	

c) How the circuit breaker of a circuit that supplies the set of luminaires in a room, should be selected?

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The circuit breaker of a circuit should be selected if it is thermal, hybrid or magnetic, it does should not be less than 15A / depend a section of the wire. Tripping not more.

d) Consider that lighting demand factor is 0.9, receptacles demand factor is 0.4, curtain drivers demand factor is 1, and the remaining circuits in the panel are used to supply a connected load of 4 kVA with a demand factor of 0.6 and a simultaneity factor of 0.8. What is the panel total demand load?

for light: $P = 6 \times 60 = 360\,W$; Connected: $S = \frac{360}{0,9} = 400\,VA$ Demand: $400 \times 0,9 = 360\,VA$

for receptacles: Connected: $S = 3 \times 1,5 \times 220 = 990\,VA$, Demand: $990 \times 0,4 = 396\,VA$ x3

for drivers: connected: $S = 1 \times 220 = 220\,VA$; Demand: 220 VA x3

for remaining: Demand: $S = 6 \times 0,6 = 2,4\,kVA$; ~~$S = 4 \times 0,8 = 3,2\,kVA$~~ ~~$S = 3\,kVA$~~

~~total demand load is 6,996 KVA~~ ~~$S = 3,996\,kVA$~~ $\Rightarrow S = 4,22\,kVA$

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e) Consider a building where the following electrical distribution panels are used in addition to the rooms' panel previously described in question b):

- Internal Public Lighting panel, single phase, Demand load 2 kVA, Simultaneity Factor 0.9.
- External Public Lighting panel, three phase, Demand load 6 kVA, Simultaneity Factor 0.9.
- Mechanical loads panel, three phase, Demand load 9 kVA, Simultaneity Factor 1.

All these panels are supplied from a distribution main board, draw a distribution line diagram. , calculate its Demand load & D.

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internal public lighting: net load: $\frac{2\,kVA}{0,9} \times 0,9 = 2,2\,kVA$

external public lighting: net load: $\frac{6\,kVA}{0,9} = 6,6\,kVA$

Mechanical load: net load: 9 kVA

for the 3 rooms: net load: $3 \times 4,22\,kVA = 12,66\,kVA$

the total net load: $2,2 + 6,6 + 9 + 12,66 = 30,46\,kVA$