BILGI UNIVERSITY
DEPARTMENT of ELECTRICAL & ELECTRONICS ENGINEERING

Asst. Prof. Dr. Mustafa BAYSAL

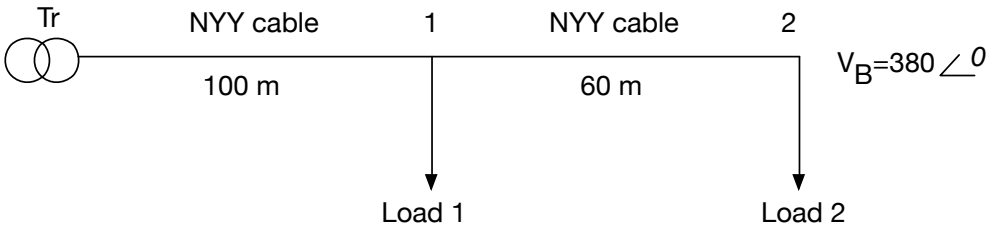
Name-Surname :
Student Number :
Signature :
Row # :

**POWER DISTRIBUTION SYSTEMS** **Midterm Exam** **April 27th,2020**

1. *In the following single phase distribution feeder, the nominal phase voltage is 380 V. Calculate the voltage drop between transformer and terminal 2 for the following cases;*

2.

| *Case* | *Cable Size (bw Tr and 1)* | *Cable Size (bw 1 and 2)* | *Load 1* | *Load 2* |
|---|---|---|---|---|
| a) | *4x25ç* | *4x25ç* | 10+Row# [kVA] (p.f. 0.8) | 5 [kW] (p.f. 0.8) |
| b) | *4x25ç* | *4x25ç* | 10+Row# [kVA] (p.f. 0.9) | 5 [kW] (p.f. 0.8) |
| c) | *4x25ç* | *4x16ç* | 10+Row# [kVA] (p.f. 0.9) | 5 [kW] (p.f. 0.8) |




Voltage drop factors for 0,6/1 kV cables YVV(NYY)

U=380 V

| Conductor c.s.a. [mm²] | Voltage drop factor ΔU [V/kWkm] PF | | | | | | Percent voltage drop factor ΔU% [%/kWkm] PF | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 0,95 | 0,90 | 0,80 | 0,70 | 0,60 | 1 | 0,95 | 0,90 | 0,80 | 0,70 | 0,60 |
| 4x1,5 | 38,16 | 38,26 | 38,30 | 38,38 | 38,47 | 38,56 | 10,04 | 10,07 | 10,08 | 10,10 | 10,12 | 10,15 |
| 4x2,5 | 23,34 | 23,43 | 23,48 | 23,55 | 23,63 | 23,72 | 6,143 | 6,167 | 6,179 | 6,198 | 6,218 | 6,241 |
| 4x4 | 14,53 | 14,62 | 14,66 | 14,74 | 14,81 | 14,90 | 3,823 | 3,847 | 3,858 | 3,878 | 3,898 | 3,921 |
| 4x6 | 9,711 | 9,798 | 9,839 | 9,910 | 9,982 | 10,06 | 2,555 | 2,578 | 2,589 | 2,608 | 2,627 | 2,649 |
| 4x10 | 5,763 | 5,845 | 5,884 | 5,951 | 6,018 | 6,096 | 1,517 | 1,538 | 1,548 | 1,566 | 1,584 | 1,604 |
| 4x16ç | 3,632 | 3,709 | 3,746 | 3,809 | 3,873 | 3,947 | 0,956 | 0,976 | 0,986 | 1,002 | 1,019 | 1,039 |
| 4x25ç | 2,289 | 2,366 | 2,402 | 2,463 | 2,526 | 2,598 | 0,602 | 0,623 | 0,632 | 0,648 | 0,665 | 0,684 |
| 4x35ş | 1,650 | 1,724 | 1,758 | 1,818 | 1,878 | 1,948 | 0,434 | 0,454 | 0,463 | 0,478 | 0,494 | 0,513 |
| 4x50ş | 1,218 | 1,292 | 1,327 | 1,386 | 1,447 | 1,517 | 0,321 | 0,340 | 0,349 | 0,365 | 0,381 | 0,399 |
| 4x70ş | 0,845 | 0,916 | 0,949 | 1,007 | 1,065 | 1,132 | 0,222 | 0,241 | 0,250 | 0,265 | 0,280 | 0,298 |
| 4x95ş | 0,611 | 0,681 | 0,715 | 0,772 | 0,831 | 0,898 | 0,161 | 0,179 | 0,188 | 0,203 | 0,219 | 0,236 |
| 4x120ş | 0,484 | 0,553 | 0,586 | 0,642 | 0,699 | 0,765 | 0,127 | 0,146 | 0,154 | 0,169 | 0,184 | 0,201 |
| 4x150ş | 0,395 | 0,464 | 0,497 | 0,553 | 0,610 | 0,675 | 0,104 | 0,122 | 0,131 | 0,145 | 0,160 | 0,178 |
| 4x185ş | 0,316 | 0,385 | 0,418 | 0,474 | 0,531 | 0,596 | 0,0831 | 0,101 | 0,110 | 0,125 | 0,140 | 0,157 |
| 4x240ş | 0,243 | 0,313 | 0,345 | 0,401 | 0,458 | 0,524 | 0,0641 | 0,0823 | 0,0909 | 0,106 | 0,121 | 0,138 |
| 4x300ş | 0,197 | 0,266 | 0,299 | 0,354 | 0,411 | 0,477 | 0,0517 | 0,0699 | 0,0786 | 0,0933 | 0,108 | 0,126 |
| 4x400ş | 0,157 | 0,225 | 0,258 | 0,313 | 0,369 | 0,434 | 0,0413 | 0,0593 | 0,0678 | 0,0824 | 0,0972 | 0,114 |
| 4x500ş | | | | | | | | | | | | |

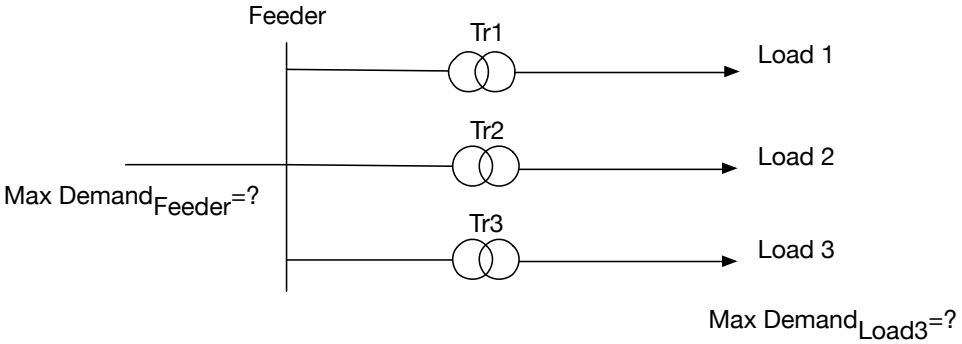
2. *At the end of a power distribution system, a certain feeder supplies three distribution transformers, each one supplying a group of customers whose connected loads are as under:*

| *Transformer* | *Maximum Load [kw]* | *Load factor [%]* |
|---|---|---|
| *Tr1* | 1000+10*Row# | 40 |
| *Tr2* | 1200+10*Row# | 20 |
| *Tr3* | *?* | *15* |

*If the diversity factor and load factor of feeder are 1.3 and 30%, respectively, find;*

*a) The maximum load on the Tr3*

*b) The maximum load on the feeder*

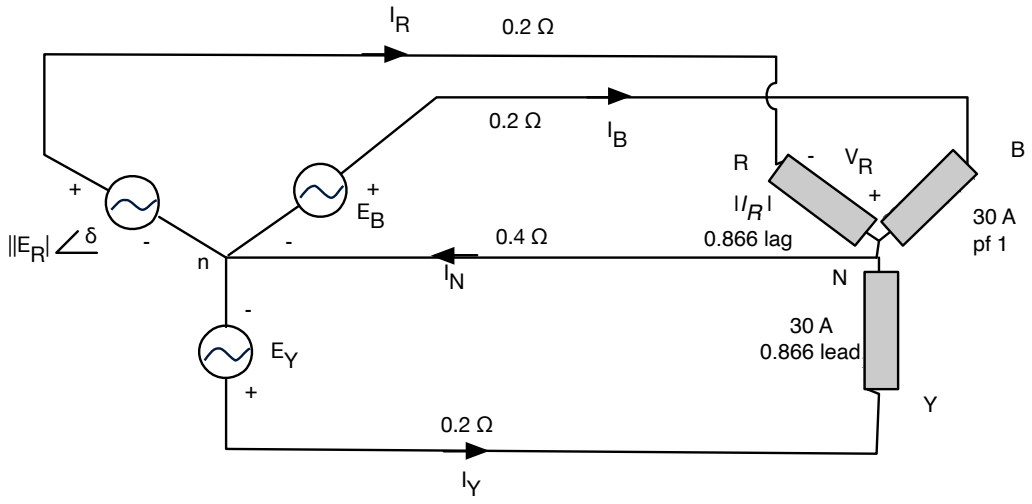



3. *A 3-phase, 4-wire distributor supplies a balanced voltage of 230 V (phase-neutral) to a load 30 A at p.f. 0.866 leading for Y phase and 30 A at unity p.f. for B phase. The resistance of each line conductor and of neutral line are 0.2 Ω and 0.4 Ω, respectively. The p.f. of load at R phase is 0.866 lagging and magnitude of sending end voltage of R phase, $|E_R|$ is (235+Row#) Volt. Calculate;*

*a) The magnitude of current for R phase, $|I_R|$*

*b) The neutral current, $I_N$.*

*c) Phase angle of sending end voltage, δ*



| Row# | Student Id |
|---|---|
| 1 | 116202009 |
| 2 | 115202027 |
| 3 | 115202056 |
| 4 | 115202018 |
| 5 | 115202036 |
| 6 | 116202151 |
| 7 | 116202138 |
| 8 | 116202069 |
| 9 | 116202147 |
| 10 | 116202021 |
| 11 | 111202022 |
| 12 | 115202044 |
| 13 | 117207071 |
| 14 | 115200084 |
| 15 | 115202111 |
| 16 | 114202079 |
| 17 | 115202086 |
| 18 | 115207053 |
| 19 | 116202065 |
| 20 | 116202002 |
| 21 | 115202119 |
| 22 | 115202081 |
| 23 | 115202078 |
| 24 | 116202135 |
| 25 | 115202016 |