Kafrelsheikh University Faculty of Engineering Department: Mechanical Engineering Year : 2rd year(2007) 2020-2021 Subject: Electrical Engineering		Date: 8-3-2021 Time Allowed: 3:00 hrs. Full Mark: 70 Marks. Final Exam:--- Academic Code: EPM 2133

1- All the questions according to ILOs: a1, a3, a4, a8, b2, b9, b14, c3, c10.
2- Number of pages : 2, No. of questions : 5
3- The weight of each problem is indicated.
4- This a closed book exam.
5- Clear, systematic answers and solutions are required in general, marks will not be assigned for answers and solutions that require unreasonable (in the opinion of the instructor) effort to decipher.
6- Ask for clarification if any question statement is not clear to you.
7- Attempts in all questions.
8- The exam will be marked out of 70.

Q1 **10 Marks**

A d.c. 3-wire system is to be converted into a 3-phase, 4-wire system by adding a fourth wire equal in X-section to each outer of the d.c. system. If the percentage power loss and voltage at the consumer's terminals are to be the same in the two cases, find the extra power at unity power factor that can be supplied by the a.c. system. Assume loads to be balanced.

Q2 **10 Marks**

A 40 km long transmission line supplies a load of 6 MVA at 0·85 p.f. lagging at 33 kV. The efficiency of transmission is 92%. Calculate the volume of aluminum conductor required for the line when (i) single phase, 2-wire system is used (ii) 3-phase, 3-wire system is used. The specific resistance of aluminum is $2{\cdot}85 \times 10^{-8}\ \Omega$ m.

Q3 **20 Marks**

1- A single phase line has two parallel conductors 2 meters apart. The diameter of each conductor 1.4 cm. calculate the loop inductance per km of the line. **10**

2- A 3-phase overhead transmission line has its conductors arranged at the corners of an equilateral triangle of 1.8 m side. Calculate the capacitance of each line conductor per km. Given that diameter of each conductor is 1·24 cm.(Given that $\varepsilon_0 = 8{\cdot}854 \times 10^{-12}$ F/m) **10**

Q4 **15 Marks**

1. What are the main requirements of the insulating materials used for cables ? **5**

2. Calculate the capacitance and charging current of a single core cable used on a 3-phase, 66 kV system. The cable is 1 km long having a core diameter of 10 cm and an impregnated paper insulation of thickness 7 cm. The relative permittivity of the insulation may be taken as 4 and the supply at 50 Hz. **10**

Q5 **15 Marks**

A 3- phases , 380 v, 50 Hz, balanced supply, balanced loads consists of :

1- Three equal single phase loads of (30+j40) Ω connected in star, and

2- Three phases heating load of 1.2 kW

Determine:

a- The supply current, supply active power, reactive power, and power factor

b- The value of the capacitance that must be connected to improve the overall power factor to 0.99.

Obtain the results using one phase of the three phase system.

End of Exam Questions

Good Luck

Dr. Fathalla Selim and Committee