Kafr Elshiekh University
Faculty of Engineering
Department: Mechanical Engineering
Year : 2rd year(2007) 2018-2019
Subject: Electrical Engineering

Date: 3-1-2019
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 50 km long transmission line supplies a load of 60 MVA at 0.9 p.f. lagging at 33 kV. The efficiency of transmission is 90%. 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 $2.85 \times 10^{-8} \Omega$ m.

Q2   15 Marks

1- Find the inductance per km of a 3-phase transmission line using 1·4 cm diameter conductors when these are placed at the corners of an equilateral triangle of each side 2.2 m.   **5 Marks**

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 $\varepsilon_0 = 8·854 \times 10^{-12}$ F/m)   **10 Marks**

Q3   10 Marks

1- What are the mechanisms by which the heat is transferred through the cable ?   **5 Marks**

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   **5 Marks**

cm. The relative permittivity of the insulation may be taken as 4 and the supply at 50 Hz.

Q4   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 :

    i-   One phase of the three phase system,

    ii-   The equivalent single phase circuit.

Q5   20 Marks

    1- What is the principle of operation of dc motor? And what are the electrical machines types?   10 Marks

    2- A 220 V d.c. shunt motor has an armature-resistance of 0.25 ohm, and runs at 900 r.p.m., taking an armature current 20 A. It is desired to reduce the speed to 700 r.p.m. (i) If the armature current remains the same, find the additional resistance to be connected in series with the armature-circuit. (ii) If, with the above additional resistance in the circuit, armature current decreases to 10 A, find the speed of the motor.   10 Marks

End of Exam Questions

Good Luck

Dr. Fathalla selim and committee