



**Answer the Following Questions :**

**Question (1)**

**(15 Marks)**

- a) **Draw** the connection diagram to perform the parameters of :
- Short transmission line
  - Medium transmission line (nominal  $\pi$  method)
- b) **Show**, experimentally, how voltage regulation and transmission efficiency are determined for medium lines using T- method.
- c) **Explain** the relation between the receiving end power factor and voltage regulation of transmission lines.

**Question (2):**

**(15 Marks)**

- a) **List** the different losses in a transformer. Explain the test used to find each loss.
- b) **Define** the voltage regulation. Under what load condition(s), a negative voltage regulation may be obtained? What are the parameter(s) which cause(s) voltage regulation? Verify your answer by the aid of a phasor diagram.
- c) A 15 KVA, 2300/230 V single-phase transformer has the following test results:

Test	Voltage (V)	Current (A)	Power (W)
Open-circuit	2300	0.21	50
Short circuit	47	6.0	160

For both test, the measuring instruments were in high voltage-side.

- Estimate** the transformer equivalent circuit parameters
- Determine** the efficiency and voltage regulation if the transformer is operating at full load at a power factor of 0.8 lagging.

**Question (3):**

**(16 Marks)**

- a) **Discuss** the disadvantages of low power factor.
- b) **Discuss** the various methods used to improve the power factor and **explain** the importance of such improvements in the electrical power system.
- c) **Draw** the connection diagram to perform the power factor improvement of a lagging power factor. **Identify** the reading of each meter and hence write the necessary equation to find the capacitance value required.

- d) A single- phase motor connected to a power supply at 400 V takes 31.7 A at 0.7 power factor lagging. It is desired to improve the power factor to 0.9 lagging value. **Calculate** the capacitance required in parallel with motor to reach this value.
- 
- 

**Question (4):**

**(14 Marks)**

- a) **Discuss** what will happen in each of the following cases:
- i. the magnetic core of a transformer is replaced by non-magnetic core
  - ii. A 380 Volts 50 Hz supply is connected to the primary of a transformer rated at 50 Hz, 230/115 V
  - iii. Short-circuit test of a transformer is performed under rated voltage
- b) **Explain** the following practical states:
- i. In the load test of a single phase transformer, it is noted that the wattmeter connected to the primary reads even after the load on the secondary is thrown off.
  - ii. In the performance test of a medium transmission line, it is noted that the receiving end voltage increases with decreasing the load and it reaches values greater than the sending end voltage at the lightly loads.
  - iii. When an ordinary transformer rated at 2300/230 V is connected to be a step-up auto transformer, it is found that the secondary voltage be 2070 V
  - iv. In the lagging power factor improvement test, it is noted that the ammeter located at the receiving end reads a current lower than that before the improvement.

---

---

Best wishes

Dr. Amlak Abaza & Dr. Fathalla Selim