0091

Q. No. EEO - 440

ND/B.Tech./Even

Reg/2022-23

2022-23

FUNDAMENTALS OF POWER SYSTEMS

EEO - 440

Full Marks : 25 Time : Ninety Minutes

The figures in the margin indicate full marks.

Instructions :

(i) Asnwer Question No.1 **(Compulsory)** from Group A and any one question from Group B

(ii) All Parts of any questions should be answered at one place

Group - A (Compulsory)

1. (a) What are the components of power system? Write three drawbacks of power system.

   (b) Draw a daily load curve.

   (c) What is the advantages of interconnected power system?

   (d) What is the advantage of high voltage power transmission?

   (e) Explain why AC resistance of a conductor is higher than DC resistance?

P.T.O.

(f) What do you mean by load factor? The monthly load on a power system is given in the table. During each month, power is assumed constant at an average value. Find the monthly load factor.

Annual system load	Load (MW)	Annual system load	Load (MW)
January	7	July	17
February	7	August	15
March	5	September	11
April	3	October	5
May	7	November	7
June	13	December	8

(1+2)+1+1+1+1+(1+2)=10 [CO1, CO2]

Group - B (Any one from the following)

2. (a) Discuss the causes and disadvantages of a low power factor.

   (b) A 3-phase, 5 kW induction motor has a power factor of 0.75 lagging. A bank of capacitor is connected across the supply terminals and power factor raised to 0.9 lagging. Determine the KVAR rating of the capacitors connected in each phase. 5+10=15 [CO3, CO4]

3. (a) Discuss the various methods for power factor improvement.

   (b) A single phase motor connected to 240 volts, 50 Hz supply takes 240 amp at a power factor of 0.75 lagging.

A capacitor is shunted across the motor terminals to improve the power factor to 0.9. Determine the capacitance of the capacitor to be used.

5+10=15 [CO3, CO4]

Course Outcomes :

- CO1 : Given Specification leads to design of network, choice of optimal Voltage, Transmission line and its material.
- CO2 : Given Specification leads to study of suitable system parameters and incorporating laws of Power systems to choose the most applicable.
- CO3 : Given Specification emphasises on the different Tariff structures, by which one can able to judge, compare and select a suitable Tariff plan.
- CO4 : Given Specification facilitates the design of equipments on the basis of power factor.
- CO5 : Given specification will give knowledge about the different types of faults and its severity, which can help to design the protection schemes for those faults.

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NETWORK THEORY

EEO - 443

Full Marks : 25 Time : Ninety Minutes

The figures in the margin indicate full marks.

Answer any *five* questions.

Graph paper shall be supplied, if required.

1. A solenoid coil was found to have a resistance of 12Ω when measured with a multimeter. If the solenoid coil draws a current of 5A when connected to a 100 V, 1000 Hz supply. Calculate the inductance of the coil and the power factor. 5 [CO1]

2. Draw the phasor diagram of a RLC series circuit for (i) leading and (ii) lagging p.f. 5 [CO1]

3. A series resonance network consisting of a resistor of 30Ω, a capacitor of 2μF and an inductor of 20 mH is connected across a 9 V sinusoidal supply voltage. Calculate (i) the resonant frequency (ii) the current at resonance, (iii) the voltage across the inductor at resonance (iv) the voltage across the capacitor at resonance and (v) the quality factor. 5 [CO1]

P.T.O.

4. Derive the equivalent inductance of the following circuit (shown in Fig. 1) 5 [CO1]

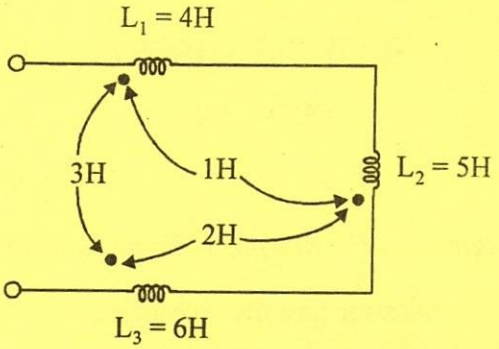

Fig.1

5. Find the voltage across the $20\,\Omega$ resistor using Thevenin's theorem. 5 [CO2]

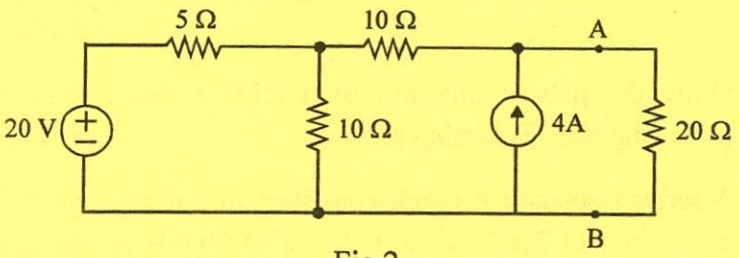

Fig.2

6. State the maximum power transfer theorem for AC circuit. Derive the necessary condition for maximum power transfer. 5 [CO2]

Course Outcomes :

- CO1 : Apply the knowledge of basic circuital law, like nodal analysis and mesh analysis, to write the equations for large linear and coupled circuits
- CO2 : Apply Thevenin's and Norton's theorems to analyse and design for maximum power transfer