



Electrical Power (FCR141)

Please Answer the Following Questions:

Question # 1:(6 Points)

Attempt any three parts of the following: (3x2pts)

- a- Discuss why there is a need for alternative energy forms.
- b- How Nuclear Power Works.
- c- Discuss briefly the advantages and disadvantages of solar power.
- d- State the two ways to increase the transported power.

Question # 2: (10 Points)

A positive sequence balanced Y-connected source (a, b, c) supplies a balanced Δ -connected load (A, B, C). If the line current $I_{aA}=20\angle-36^\circ$ A and load impedance is $(12 + j18) \Omega/\text{phase}$, find:

- a- Phase currents of the load. (3 pts)
- b- Phase voltages of the load and phase voltages of the supply. (5 pts)
- c- Active power consumed by the load. (2 pts)

Question #3: (9 Points)

A 6 kVA, 200/600V, single-phase transformer has the following parameters referred to the low voltage side, $R_{eq1}=0.8\Omega$, $X_{eq1}=1.5 \Omega$, $R_o=400 \Omega$, $X_o=100 \Omega$. If the transformer supplies a load current of 10 A at 0.8 power factor lagging, calculate:

- a- The no-load current and transformer core loss. (3 pts)
- b- The secondary terminal voltage under loading conditions. (2 pts)
- c- Transformer copper loss and its efficiency. (4 pts)

Q4(3+3+4 mark)

- 4-a)-Explain with a diagram the construction of a dc machine.
- 4-b)-Draw speed –torque-current characteristics for separate, shunt and series motors and compare between them.
- 4-c)-A series-connected dc motor has an armature resistance of 0.5Ω and field winding resistance of 1.5Ω . In driving a certain load, where the output shaft power and output shaft torque are 3450W and 27Nm respectively. from a voltage source of $V = 220\text{V}$. The efficiency of this motor is 78% . Find (i) the motor current, (ii) the speed (iii) power developed and (iv) the rotational loss.

Q5(4+4mark)

- 5-a)-Explain the construction, advantages, disadvantages and applications of printed circuit (disc) DC motor.
- 5-b)-A stepper motor has a resolution of 1000 steps/rev in the half step mode operation. If it is operated in full step mode, determine (i) resolution and (ii) number of steps required to turn the rotor through 72° .

Q6(3+4mark)

- 6-a)-Explain the principle of operation of the 3 phase induction motor and showing why cannot run at the synchronous speed?
- 6-b)-A 480-V , 60 Hz , 50-hp , three phase induction motor is drawing 70A at 0.9 PF lagging. The stator copper losses are 2 kW , and the rotor copper losses are 600W . The friction and windage losses are 500 W , the core losses are 1700W , and the stray losses are negligible. Find the following quantities: (i) The air-gap power (ii) The power converted (iii) The output power (iv) The efficiency of the motor.