Fayoum University
Faculty of Engineering
Electrical Department

2nd year Electric Power and Machines
Final Exam- 20 Jan 2016
Time: 3hours

Energy Conversion (اسس تحويل الطاقة)

Answer all the following questions:

Question 1: [16 points, 30 minutes]

A- define the following terms:
Global warming- Mechanical energy- Electrical energy- Nonrenewable energy- Electromagnetic energy.

B- Explain thedetails of the energy conversion processes in both of the following:
Nuclear power plant- Tidal power plant- Fossil fuels power plant- Stirlingdish.

C- Fig.1 shows two blocks of masses m1= 4 kg and m2= 8 kg are released from rest. What is the change of the potential energy of the system after the blocksshave moved 20 cm?

Question 2:Put (True) or (False) and justify the false statement [30 points, 40 minutes]

1- Canada is the largest country thatproduces coal.
2- In electromagnetic system,the electrical energy and the mechanical energy are interconverted via the magnetic field.
3- Thermal energy is a kind of mechanical energy.
4- Nuclear energy is a kind of kinetic energy.
5- In nuclear power plant, the heat isproduced by nuclear fusion.
6- Small amount of uranium can produces asmall amount of energy.
7- Renewable energy is more efficient than fossil fuels.
8- The initial cost of renewable energy power plant is cheap.
9- Anything that has mass and movement has potential energy.
10- Photovoltaic power plant is more efficient than parabolic trough power plant.
11- Energy from the sun can be directly converted toelectricity.
12- Biomass direct combustion can produce only electricity.
13- Pyrolysis can produce biodiesel.
14- Electromagnetic energy is the total amount of kinetic and potential energy in a system.
15- Oil is the cleanest of all fossil fuels.

Question 3: [10 points, 20 minutes]

A- Drive the equation which calculates the electric energy of a wind turbine?
B- Fig.2 shows the power curve of a 200kW wind turbine determine the rated output power,and calculate the capacity factor and the output electric energy when the turbine operate at average wind speed 8 m/s. Calculate the wind power density if the rotor diameter is80m.
C- A wind power plant has 100 turbines, each one rated for 1.5 MW. Thecapacity factor is 35%. What is the plant's annual energy yield?

Question 4: [14 points, 30 minutes]

A- Explain the principle operation of nuclear power plant?
B- Compare with six different points between renewable and nuclear power plant?
C- Write six different things to help tackle global warming?

Good luck

Question 5: [9 points, 20 minutes]

A- Sketch L(x) and calculate the induced emf in the excitation coil for a linear actuator shown in Fig.3?
B- Illustrate the Concept map of electromechanical system modeling?
C- Calculate the torque and force acting on the plunger for a linear actuator shown in Fig.3?

Question 6: [6 points, 10 minutes]

A- A 1 kg brick falls off a 4 m high roof. It reaches the ground with a velocity of 8.85 m/s. What is the kinetic energy of the brick when it starts to fall and when it reaches the ground?
B- Calculate the kinetic energy of a 40 g golf ball traveling at (a) 20 m/s (b) 40 m/s (c) 50m/s?
C- Calculate the maximum power for a horizontal-axis wind turbine whose blades sweep a circular area with a diameter of 100 m, and for an upstream wind speed of v = 12 m/s?

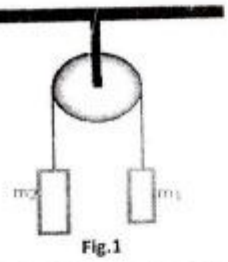

Fig.1

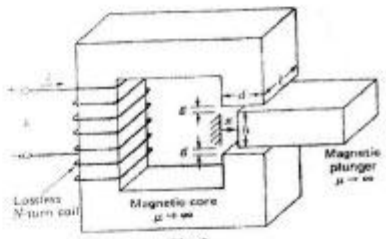

Fig.3

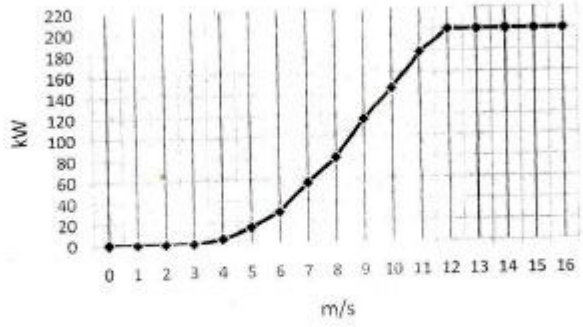

Fig.2