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SEAT No. _____

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SARDAR PATEL UNIVERSITY

M.Sc. (Renewable Energy)

Semester: Second

Course Code: PS02EREN01

Course Title: Alternate Energy Sources

Date and Day: 26-03-2019, Tuesday

Time: 10:00 AM to 1:00 PM

Total Marks: 70

- Note: 1. All the questions are compulsory
2. Figures on the right bracket indicated marks

Q-1: Select the correct answer

(10)

- i. In MHD, gas velocity should be
 - a. 10^3 m/sec
 - b. 10 m/sec
 - c. 10^2 m/sec
 - d. 10^4 m/sec
- ii. Magneto Hydro Dynamic power generation is based on
 - a. Thermoelectric effect
 - b. Electromagnetic induction
 - c. Eddy effect
 - d. Electro-chemical process
- iii. Which of these materials not used for MHD duct wall.....
 - a. Magnesium oxide
 - b. Hafnia
 - c. Strontium zirconate
 - d. Magnese zirconate
- iv. Thermoelectric converter is a form of
 - a. IC engine
 - b. Heat Engine
 - c. Cryogenic engine
 - d. Nuclear reactor
- v. Whenever there is a temperature difference between the two dissimilar metals, thermal electromotive force is developed in the loop, the effect is
 - a. Seebeck Effect
 - b. Peltier Effect
 - c. Joule Effect
 - d. Thomson Effect
- vi. Energy required to extract an electrons from a metal is called as
 - a. Potential barrier
 - b. Work function
 - c. Efficiency
 - d. None of the above
- vii. Minimum temperature of emitter required in thermionic convertor should be
 - a. 900°C
 - b. 800°C
 - c. 1000°C
 - d. 500°C
- viii. The process accompanied with release of energy as well as neutrons called
 - a. Emission
 - b. Reduction
 - c. Fusion
 - d. Fission
- ix. The practical fusion ignition temperature for a D-T plasma is roughly.....
 - a. 100 million $^\circ\text{C}$
 - b. 10 million $^\circ\text{C}$
 - c. 1000 million $^\circ\text{C}$
 - d. 1 million $^\circ\text{C}$
- x. Energy required to extract an electrons from a metal is called as
 - a. Potential barrier
 - b. Work function
 - c. Efficiency
 - d. None of the above

Q-2: Answer any Eight in brief

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- i. List the assumption for the analysis of MHD generator
- ii. What are the advantages of the MHD systems
- iii. List the application of Seebeck effect.
- iv. Draw the detailed diagram of open cycle MHD generator.
- v. Explain peltier effect in details with figure.
- vi. What is Thomson effect? Explain with figure.
- vii. Explain in brief about thermionic emission
- viii. Explain in brief what is potential barrier
- ix. State the advantages of nuclear fusion.
- x. Write in short note on magnetic confinement
- xi. Write short note on ohmic plasma heating in nuclear fusion

- Q-3: (A) Explain working of seeded Inert-gas closed system MHD generator with diagram 5
B) Explain working of liquid metal MHD system with schematic diagram. 5

OR

Calculate the open circuit voltage and maximum power coefficient of MHD engine with following specification.

Plant area (A) – 0.2 m²; Distance between plates (d) – 0.4 m
Flux density (B) – 2 wb/m²; Average gas velocity (u) – 1000 m/s
Conductivity of gas (σ) – 10 mho/m

- Q-4: (A) Explain basic principle of thermo-electric power generation with diagram. 5
(B) A thermo electric power generator works between 27 °c and 427 °c. The figure of merit of the material used is $2 \times 10^{-3} \text{ }^\circ\text{K}^{-1}$. Determine the efficiency of the generator and compare with Carnot cycle efficiency 5

OR

Derive an expression for the efficiency of thermo-electric generator.

- Q-5: (A) Describe the principle of working and constructional details of a basic thermionic generator (basic diode) with suitable figures 5
(B) Derive an expression for power and efficiency of thermionic generator 5

OR

Following are the data are given for thermionic generator

Cathode work function, $\phi_c=2.5$ volt; Anode work function, $\phi_a=2.0$ volt
Temperature of cathode, $T_c=2000$ °K; Temperature of surrounding, $T_s=1000$ °K
Plasma potential drop, $\phi_p=0.1$ volt; Charge of electrons, $e=1.6 \times 10^{-19}$ Coulomb
Boltzmann Constant, $k=1.38 \times 10^{-23}$ J/°K; Emissivity $\epsilon =0.2$ for electrode material used. Calculate the efficiency of the generator.

- Q-6: (A) Give the characteristics of DT reactions 5
(B) What are the main methods of plasma confinement? Describe briefly 5

OR

Explain tokamak nuclear fusion reactor with suitable diagram

