Total No. of printed pages = 7

19/5th Sem/DEE511

2021

GENERATION, TRANSMISSION AND DISTRIBUTION OF POWER

Full Marks –100

Time – Three hours

The figures in the margin indicate full marks for the questions.

Question No.1 is compulsory and answer any *four* from the rest.

1. A. Fill in the blanks : 1×10=10

(a) The standard operating frequency of AC voltage in India is _____.

(b) A thermal power plant works on _____ cycle.

(c) In hydroelectric power station, _____ energy of stored water is finally converted to electrical energy.

[Turn over

(d) Hydel power generations have _____ running cost.

(e) Surge tank is provided for the protection of _____.

(f) The most commonly used material for insulators of overhead lines is _____.

(g) In diesel engine driven power house, the fuel used is _____.

(h) The charge associated with an electron is _____.

(i) ACSR conductors are used in overhead transmission lines. The full form of ACSR is _____.

(j) A certain system has some output of 120 units and losses are 30% of the output. The efficiency of this system will be _____.

B. Write true/false : $1 \times 10 = 10$

(a) Distribution of AC power is done by 3-phase, 4-wire system.

(b) 1 kWh is equivalent to 360000J.

(c) In a hydroelectric plant, spillways are used to discharge surplus water on the downstream side of dam.

(d) Thermal power plants are the cleanest plant with low running cost.

(e) The active power loss in an overhead transmission line is mainly due to the ground conductor.

(f) In chemical reactions, the nuclei donot change and only the valence electrons are shared or exchanged.

(g) The service mains connect the distributor and the consumer's terminal.

(h) Solar power generation is a renewable generation system.

(i) Control rods used in a nuclear reactor are made of copper.

(j) Alpha particles are negatively charged particles.

2. (a) Write some important criteria for site selection of hydroelectric power plants. 7

(b) How hydroelectric power plants are classified ? 5

(c) A hydroelectric power station has a reservoir of area 2.4 square kilometres and capacity 5×10^6 m^3. The effective head of water is 100 meters. The penstock, turbine and generation efficiencies are respectively 95%, 90% and 85%. If a load of 15000 kW has been supplied for three hours, find the fall in reservoir level. 8

3. (a) What is the energy equivalent of 1 a.m.u ? 1

(b) Why control rods are used in nuclear reactors ? 1

(c) What are nuclear fission and nuclear fusion reactions ? Explain with examples. 2.5+2.5=5

(d) Write the names of two good moderating materials used in nuclear reactors. 2

(e) What is the source of heat in nuclear reactor ? 1

(f) Consider the following nuclear reaction : 10

$$^{235}_{92}U + ^{1}_{u}n \rightarrow ^{141}_{55}Ba + ^{92}_{36}Kr + 3^{1}_{U}n + Q$$

Using this reaction, estimate the energy released by 1kg of uranium.

Given, mass of U-235 = 235.045733u

Mass of one neutron = 1.008665u

Mass of Barium atom = 140.9177u

Mass of Krypton atom = 91.8854u

1 a.m.u = 931 MeV.

4. (a) How will you define one unit of electrical energy ? What is B.O.T. ? 2

(b) What do you mean by calorific value of fuel ? 1

(c) A steam power station spends Rs. 30 lakhs per annum for coal used in the station. The coal has a calorific value of 5000 kcal/kg and costs Rs. 300 per ton. If the station has thermal efficiency of 33% and electrical efficiency of 90%, find the average load on the station. 6

(d) Write some important criteria for site selection of thermal power plants. 6

(e) What are the main equipments used in thermal power plant ? 5

5. (a) Draw neat diagrams of three phase star and delta connected systems properly showing the line voltage, line current, phase voltage and phase currents. 5+5=10

(b) An overhead 3-phase transmission line delivers 5000kW at 22kV at 0.8 p.f. lagging. The resistance and reactance of each conductor is 4Ω and 6Ω respectively.

Determine : 10

(i) sending end voltage

(ii) percentage regulation

(iii) transmission efficiency.

6. (a) What do you mean by an electric power distribution system ? What are feeders, distributors and service mains ? How distribution systems are classified ? 5+5=10

(b) Now-a-days electrical energy is generated, transmitted and distributed in the form of AC all over the world. With a neat diagram, show how electrical energy is transmitted from generating station and finally distributed to consumers. 10

7. Write short notes on any *two* : 10×2=20

(a) India's present power scenario

(b) Overhead versus underground distribution

(c) Renewable energy utilization in India.