**Seat No.: _____** **Enrolment No._____**

# GUJARAT TECHNOLOGICAL UNIVERSITY

**BE - SEMESTER–IV (NEW) - EXAMINATION – SUMMER 2017**

**Subject Code: 2140908** **Date: 06/06/2017**

**Subject Name: Electrical Power Generation**

**Time: 10:30 AM to 01:00 PM** **Total Marks: 70**

**Instructions:**

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

**Q.1** **Short Questions** **14**

**1** A nuclear power plant is invariably used as a
(a) peak load plant, (b) base load plant, (c) spinning reserve plant, (d) any of the above

**2** Surge tank is provided for the protection of …….

**3** As steam expands in turbine
(a) its pressure increases, (b) its specific volume increases, (c) its boiling point increases, (d) its temperature increases.

**4** The equipment installed in power plants to reduce air pollution due to smoke is
(a) Induced draft fans, (b) De-super heaters, (c) Electrostatic precipitators,
(d) Re-heaters.

**5** Which of the following material can be used as a moderator?
(a) Graphite, (b) Heavy water, (c) Beryllium, (d) Any of the above.

**6** A gas turbine works on …… cycle.

**7** Which of the following is not a source of power?
(a) Thermocouple, (b) Photovoltaic cell, (c) Solar cell, (d) Photoelectric cell

**8** Most of the solar radiation received on the earth surface is within the range of:
(a) 0.25 to 0.4 micron, (b) 0.4 to 0.8 microns, (c) 0.6 to 0.95 microns, (d) 0.1 to 0.25 microns

**9** What is the maximum power efficiency of wind energy system?

**10** What is diversity factor?

**11** What is plant use factor?

**12** What is the difference between system earthing and equipment earthing?

**13** For annual compound interest of 8%, sinking fund factor after 20 years will be ……..

**14** When single line to earth fault occurs on an ungrounded neutral system, the capacitive fault current becomes ……. times the normal per phase capacitive current. (a) 1, (b) 0, (c) 3, (d) $\sqrt{3}$.

**Q.2** **(a)** Explain the points to be considered while selecting a site for steam power station. **03**

**(b)** Draw the schematic arrangement of diesel power station. **04**

**(c)** Classify the hydro turbine according to operating heads. Explain the hydro turbine used for high operating heads. **07**

**OR**

**(c)** With related to steam power station, explain the working of following in detail: Air pre-heater, Boiler, Super heater, Condenser, Feed water heater, Coal and Ash handling plant, Boiler Feed Pump. **07**

**Q.3** **(a)** List the main stages of nuclear power station stages. Explain any one of the stage **03**

in detail.

**(b)** Explain the working principle of closed cycle gas turbine power plant with its schematic arrangement. **04**

**(c)** A consumer takes a steady load of 250 kW at a power factor of 0.8 lagging for 10 hours per day and 300 days per annum. Which one of the following annual tariffs would be suitable for this consumer? **07**

Tariff 1: Rs. 1.20 per kWh + Rs. 1,200 per kVA per annum

Tariff 2: Rs. 1.00 per kWh + Rs. 1,200 per kW per annum + 25 paise per kVARh

**OR**

**Q.3** **(a)** Draw the neat schematic arrangement of a nuclear power station. **03**

**(b)** A hydro station has to operate with a mean head of 39 meters and supplied from a reservoir at the rate of 94 $m^3$/sec. If density of water is 1000 kg/$m^3$ and plant efficiency is 80%, determine (a) actual plant capacity in MW and (b) yearly actual output in MWH. **04**

(Hint: Gross plant capacity = 9.81 * water head * weight of water)

**(c)** The load on a power plant on a typical day is as under: **07**

| **Time** | 12 NIGHT – 5 AM | 5 AM – 9 AM | 9 AM – 6 PM | 6 PM – 10 PM | 10 PM – 12 NIGHT |
|---|---|---|---|---|---|
| **Load (MW)** | 20 | 40 | 80 | 100 | 20 |

Plot the load curve and load duration curve. Find the load factor of the plant and the energy supplied by the plant in 24 hours.

**Q.4** **(a)** What are the sources and features of renewable energy sources? **03**

**(b)** List the advantages and disadvantages of Wind Energy Conversion System. **04**

**(c)** Explain working principle, cell concept and block diagram of Solar Photovoltaic (SPV) system. **07**

**OR**

**Q.4** **(a)** Explain Distributed energy systems and Dispersed generation (DG). **03**

**(b)** What is solar radiation spectrum? Explain direct and diffused radiation. **04**

**(c)** Explain the working of horizontal and vertical axis wind turbines. **07**

**Q.5** **(a)** Enlist the application of solar photovoltaic system. Explain any one of them. **03**

**(b)** A 33 kV, 3-phase, 50 Hz, 60 km transmission line has a capacitance to ground of each line equal to 0.015 μF per km. Determine the inductance and kVA rating of the Peterson coil. **04**

**(c)** Classify the sub-stations according to service requirement and constructional features. Compare outdoor substation and indoor substation. **07**

**OR**

**Q.5** **(a)** Discuss the scheme of electrical generation for wind energy system. **03**

**(b)** Explain the importance and specifications of the following equipments applicable in sub-station: Main bus, Power transformer, Isolators, Circuit Breakers **04**

**(c)** Explain resistance grounding and voltage transformer earthing with their advantages and disadvantages. **07**

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