Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV • EXAMINATION – WINTER 2013

Subject Code: 140902 **Date: 23-12-2013**

Subject Name: Electrical Power

Time: 02:30 pm to 05:00 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 **(a)** Coal has an average energy content of 940W. Years/ton, and natural gas has an energy content of 0.036 W· year/ft^3. If 80 percent of the net energy requirement of 2.82 X 10^6 GWh were to be met with coal and 20 percent with gas, what amounts of coal and gas would be required? **07**

(b) Each line of a 3-phase system is suspended by a string of 3 similar insulators. If the voltage across the line unit is 17·5 kV, calculate the line to neutral voltage. Assume that the shunt capacitance between each insulator and earth is 1/8th of the capacitance of the insulator itself. Also find the string efficiency. **07**

Q.2 **(a)** Find the inductance per unit length of the single-phase line shown in Fig. 1. Conductors *a, b,* and c are of 0.2 cm radius, and conductors *d* and *e* are of 0.4 cm radius. **07**

(b) What are the advantages and disadvantages of nuclear power plant? **07**

OR

(b) What do you understand by thermal shielding? Also explain the functions of a reflector. **07**

Q.3 **(a)** Mention the advantages and disadvantages of a diesel power plant over a gas turbine power plant. **07**

(b) One million cubic meters of water is stored in a reservoir feeding a water turbine . If the centre of mass of the water is 50 m above the turbine and losses are negligible , how much energy (in mega watt hours) will that volume of water produce? The density of water is 993 kg/m^2 **07**

OR

Q.3 **(a)** Give the advantages and disadvantages of open cycle gas turbine power plant. Also state advantages and disadvantages and applications of solar power **07**

(b) A 3-phase, 50 Hz, 400 V motor develops 100 H.P. (74·6 kW), the power factor being 0·75 lagging and efficiency 93%. A bank of capacitors is connected in delta across the supply terminals and power factor raised to 0·95 lagging. Each of the capacitance units is built of 4 similar 100 V capacitors. Determine the capacitance of each capacitor. **07**

Q.4 **(a)** Derive an expression for most economical power factor. **07**

(b) A 2-wire d.c. distributor AB is fed from both ends. At feeding point A, the voltage is maintained as at 230 V and at B 235 V. The total length of the distributor is 200 metres and loads are tapped off as under :25 A at 50 metres from A ; 50 A at 75 metres from A30 A at 100 metres from A ; 40 A at 150 metres from A ,the resistance per kilometre of one conductor is 0·3 Ω. Calculate (i) currents in various sections of the distributor
(ii) minimum voltage and the point at which it occurs **07**

OR

Q.4 **(a)** Draw and explain the construction of pin type insulator. Also Explain How does skin effect vary with conductor material ? **07**

Q.4 **(b)** A single phase a.c. distributor AB 300 metres long is fed from end A and is loaded as under : (i) 100 A at 0·707 p.f. lagging 200 m from point A (ii) 200 A at 0·8 p.f. lagging 300 m from point A The load resistance and reactance of the distributor is 0·2 Ω and 0·1 Ω per kilometre. Calculate the total voltage drop in the distributor. The load power factors refer to the voltage at the far end. **07**

Q.5 **(a)** Draw and explain the general construction of an underground cable. Also only draw key diagram of 66Kv/ 11Kv substation **07**

(b) Explain the working principle of wind turbine with the schematic diagram. **07**

OR

Q.5 **(a)** Explain in brief about the classification of substation also differentiate between indoor substation and outdoor substation **07**

(b) Derive the expression for power loss in the distributor which is uniformly loaded with: **07**

a) fed at one end

b) feed at both ends with equal voltage

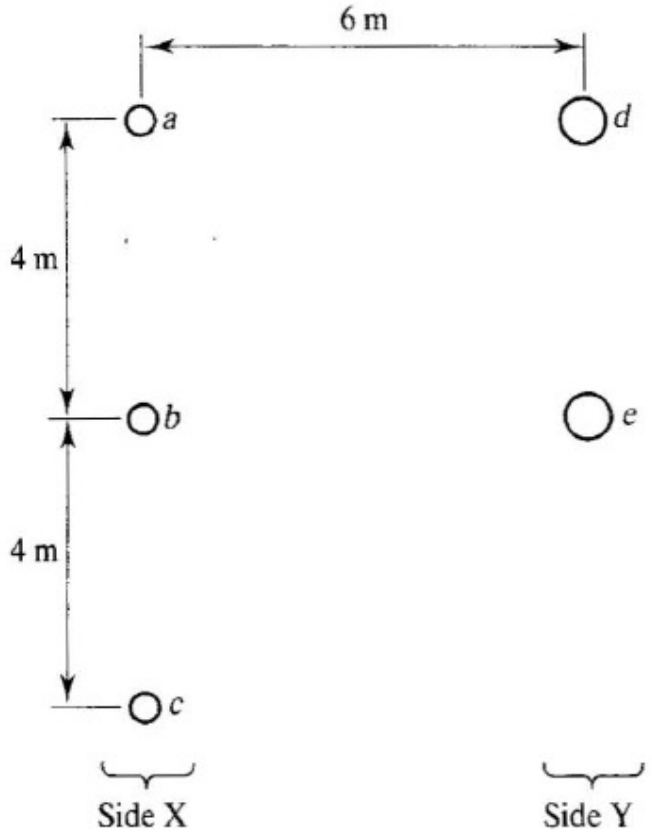

Fig.1

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