(vii) Ferranti effect on long over lines is experienced when it is
(a) lightly loaded (b) on full load at unity p.f.
(c) on full load at 0.8 p.f. lag (d) in all these cases.

(viii) The economic size of conductor is determined by
(a) Kelvin's law (b) Kirchhoff's law
(c) Faraday's law (d) none of these.

(ix) The dielectric strength of the air under normal condition is about
(a) 100 $kV_P$/cm (b) 21.1 $kV_P$/cm (c) 30 $kV_P$/cm (d) 200 $kV_P$/cm.

(x) The presence of earth in case of overhead lines
(a) increases the capacitance (b) increases the inductance
(c) decreases the capacitance (d) decreases the inductance.

## Group – B

2. (a) Draw the layout of a Nuclear power station and then explain the working principle.

(b) A Thermal power station consumes 0.8 kg of coal to generate 1 unit of electrical energy. If the calorific value of fuel is 3900 kiloCalories per kg, find out the boiler efficiency of the power station. Given:turbine efficiency is 0.95 and alternator efficiency is 0.96.

**8 + 4 = 12**

3. (a) Compare Hydroelectric, nuclear and coal-fired power stations in context of capital cost, operational and environmental issuses.

(b) What are the factors for selection of site of hydroelectric power stations?

**8 + 4 = 12**

## Group – C

4. (a) Define Skin Effect and Proximity Effect.

(b) Calculate the inductive and capacitive reactance of each phase of a three-phase 50 Hz overhead high-tension line, which has conductors of 2.5 cm diameter. The distances between the three phases are (i) 5 m between a phase and b phase, (ii) 4 m between b phase and c phase and (iii) 3 m between c phase and a phase as shown in Figure 4(b). Assume that the phase conductors are transposed regularly.

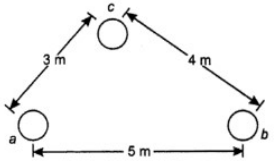

Figure.4(b)

**4 + 8 = 12**





5. (a) Derive the expression for insulation resistance and capacitanc single-core cable.

(b) Calculate the capacitance and charging current of a three-p single-core 33 kV, 50 Hz, 2 km long cable having a core diamet cm and a sheath diameter of 6 cm. Relative permittivity insulation is 3.

**7 + 5**

## Group – D

6. (a) Explain the effect of ice deposition and wind pressure on transmission line.

(b) An overhead line is erected across a span of 250 m on level sup The conductor has a diameter of 1.42 cm and has a dead wei 1.09 kg per meter. The line is subjected to wind pressure of 3 per square meter of the projected area. Line is also subjected deposition with radial thickness of 1.25 cm. Calculate the sag an inclined direction (ii) in a vertical direction. Assume a max working stress of 1050 kg per Sq.cm.

**6 + 6**

7. (a) What are the factors affecting the corona loss? Explain.

(b) Calculate the voltage distribution over the string of three suspe insulators and string efficiency for the arrangement as sho Figure 7(b).

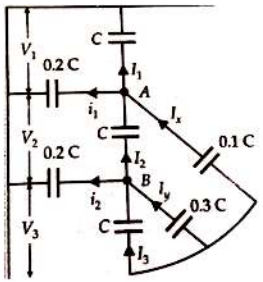

Figure 7(b)

**6 + 6**

## Group – E

8. (a) Explain the Ferranti effect in transmission lines with a P diagram.

(b) A three-phase, 50 Hz transmission line as shown in Figure 8(b), has resistance, inductance, and capacitance per phase of 1 Ω, 0.3 H and 0.01 μF, respectively and delivers a load of 25 MW at 110 kV and 0.8 p.f. lagging. Determine the efficiency of the line.

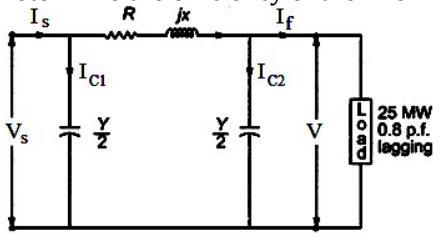


Figure 8(b)

**5 + 7 = 12**

9. (a) A generating station has a connected load of 450 MW and a maximum demand of 250 MW. The units generated being $615\times10^6$ per annum. Calculate (i) the demand factor and (ii) load factor.

(b) A DC 2-wire distributor AB is 450 meters long and is fed at both ends at 250 V. The distributor is loaded as shown in Figure 9(b). The resistance of each conductor is 0.05 ohm per km. Find the point of minimum potential and its potential.

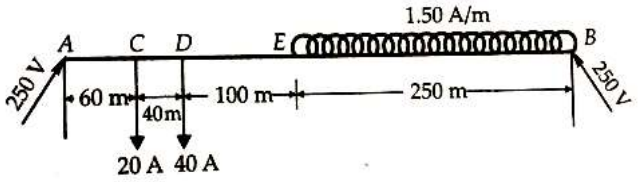


Figure 9(b)

**6 + 6 = 12**





**POWER SYSTEM I**
**(ELEC 3102)**

**Time Allotted : 3 hrs** **Full Marks :**

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group***

***Candidates are required to give answer in their own words as far a practicable.***

**Group – A**
**(Multiple Choice Type Questions)**

1. Choose the correct alternative for the following: **10 × 1**

(i) Which of the following is a base-load plant
(a) Steam plant (b) Hydro-plant
(c) Diesel plant (d) All of these.

(ii) The insulation resistance of a 2km long cable is 200 MΩ. For a l 20 km, the insulation resistance will be
(a) 20 MΩ (b) 400 MΩ
(c) 2000 MΩ (d) None of the abov

(iii) The surge impedance of 50 miles long underground cable is For a 25 miles length, surge impedance will be
(a) 25 Ω (b) 50 Ω (c) 100 Ω (d) None of the

(iv) Bundle conductors are used in EHV lines primarily for
(a) reducing cost of the line
(b) reducing corona loss and radio interference
(c) increasing stability limit
(d) none of these.

(v) Stringing chart is useful for
(a) Finding the sag in the conductor
(b) Design of tower
(c) Design of insulator string
(d) Finding the distance between the tower.

(vi) In a string of suspension insulator, maximum voltage appears across th
(a) Nearest to the conductor (b) Nearest to the cros
(c) In between two units (d) None of these.