(Set-2)

B.Tech-6th

Electric Power Transmission & Distribution

Full Marks : 70

Time : 3 hours

Q. No. 1 is compulsory and answer any five questions from the rest

The figures in the right-hand margin indicate marks

1. Answer the following : 2 × 10

(*a*) Why a.c is preferred for generation and distribution and d.c for transmission ?

(*b*) What do you understand by long transmission lines ? How capacitance effects are taken into account in such lines ?

(*c*) Describe the various methods for reducing corona effect in an overhead transmission line.

(*d*) What are the advantages of stranded conductors ?

(*e*) Why overhead system can operate at 400 kV or above but underground system offers problems at such voltages ?

(*f*) What do you mean by current loading of an underground cable ?

(*g*) Define and explain the terms : feeder, distributor and service mains.

(*h*) Name different types of earthing.

(*i*) Name the factors that should be taken into account while designing and erecting a substation.

(*j*) What is the importance of arc suppression coil grounding ?

2. (*a*) Deduce an expression for Inductance for a 3-phase overhead transmission line when the conductors are symmetrically placed. 5

(*b*) A 3-phase, 50 Hz, 66 kV overhead line conductors are placed in a horizontal plane as shown in Fig. 1. The conductor diameter is 1·25 cm. If the line length is 100 km,

Calculate total inductance per phase, assuming complete transposition of the line. 5

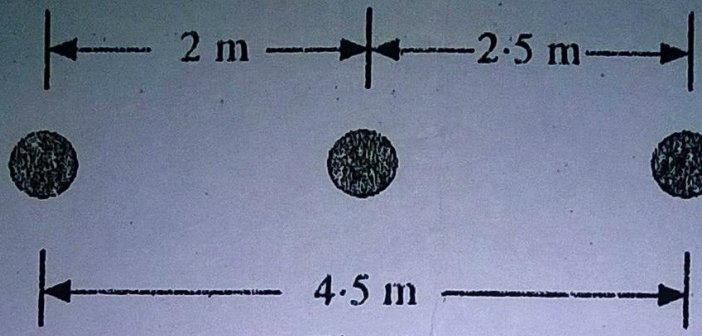

Fig. 1

3. (*a*) Derive an expression for ABCD constants of a long transmission line. 7

(*b*) What do you mean by surge impedance and surge impedance loading ? 3

4. (*a*) What is corona ? What are the factors which affect corona ? 5

(*b*) A transmission line has a span of 150 m between level supports. The conductor has a cross-sectional area of 2 cm^2. The tension in the conductor is 2000 kg. If the specific gravity of the conductor material is 9·9 gm/cm^3 and wind pressure is 1·5 kg/m length, calculate the sag and vertical sag. 5

5. (*a*) A 3-phase ring main *ABCD* fed at *A* at 11 kV supplies balanced loads of 50 *A* at 0·8 p.f lagging at *B*, 120 *A* at unity p.f at *C* and 70 *A* at 0·866 lagging at *D*, the load currents being referred to the supply voltage at *A*. The impedances of the various sections are :

Section $AB = (1 + j0{\cdot}6)\ \Omega$; Section $BC = (1{\cdot}2 + j0{\cdot}9)\ \Omega$

Section $CD = (0{\cdot}8 + j0{\cdot}5)\ \Omega$; Section $DA = (3 + j2)\ \Omega$

Calculate the currents in various sections and station bus-bar voltages at *B*,*C* and *D*. 7

(*b*) Discuss the relative merits and demerits of underground and overhead systems. 3

6. (*a*) A 3-phase, 50 Hz, 33 kV underground cable, 4 km long uses three single core cables. Each of the conductor has a diameter of 2·5 cm and the radial thickness of insulation is 0·5 cm. Determine (*i*) capacitance of the cable/phase (*ii*) charging current /phase (*iii*) total charging KVAR. The relative permittivity of insulation is 3. 5

(*b*) Explain the following methods of cable grading : 5

(*i*) Capacitance grading.

(*ii*) Intersheath grading.

7. (*a*) What are the different types of bus-bar arrangements used in sub-stations ? Illustrate your answer with diagrams. 5

(*b*) A transmission line has a capacitance of 0·1 μF per phase. Determine the inductance of Peterson coil to neutralize the effect of capacitance of (*i*) complete length of the line, (*ii*) 97% of the line, (*iii*) 90% length of the line. The supply frequency is 50 Hz. 5

8. Write short notes on : 5 + 5

(*i*) TCSC and SSSC

(*ii*) Neutral grounding.
