Q.P. Code: 38444

[Time: Three Hours] **[Marks:80]**

Note:
1. **Question No. 1 is compulsory.**
2. **Attempt any 3 questions from the remaining five questions.**
3. **Figures to the right indicate full marks.**
4. **Make suitable assumptions wherever necessary**

Q.1 a) Draw basic structure of power system. (5)

b) Explain effect of ice and wind loading on sag. (5)

c) Describe skin effect and proximity effect. (5)

d) Explain step and touch potential. (5)

Q.2 a) What is string efficiency? Explain methods of improving string efficiency (10)

b) Derive expression for inductance of 3-phase line with symmetrical and unsymmetrical spacing (10)

Q.3 a) Find the maximum sag of a line with copper conductor of 7/0/295 cm size, area 0.484 cm^2, over all diameter 0.889 cm, weight 428 kg/km and breaking strength 1973 kg. Use a safety factor of 2, span 200 m and level supports.
(i) due to weight of conductor (ii) due to additional weight of ice loading of 1 cm thickness. (10)

b) Derive expression for capacitance of single phase line for (i) without effect of earth and (ii) with effect of earth. (10)

Q.4 a) Derive ABCD constants for medium transmission line considering nominal T circuit and nominal π circuit. (10)

b) A 3-phase 132 kV, 100 km, 50 Hz, single circuit line has horizontal spacing with 3.5 m between adjacent conductors. The conductor diameter is 1.2 cm. Calculate
i) Loop inductance per phase per km, ii) line to line capacitance per phase per km, iii) line to neutral capacitance per phase per km ,iv) charging current per phase, and v) charging MVA (10)

Q. 5 a) A 300 km, 132kV, 3-phase overhead line has a total series impedance of 52 + j 200 ohms per phase and a total shunt admittance of j 1.5×10^{-3} siemens per phase to neutral.

The line is supplying 40 MVA at 0.8 pf lagging at 132 kV. Find i) ABCD constants and ii) line to line sending end voltage considering nominal π circuit. (10)

b) Fig 01 shows a single line diagram of a power system. Draw impedance diagram. Choose a base of 100 MVA, 220 kV in 50 ohm line. Ratings of equipment are: (10)

Generator: 40 MVA, 25 kV, X''= 20%

Syn motor: 50 MVA, 11 kV, X'' = 30 %

Y-Y transformer: 40 MVA, 33/220kV, X = 15%

Y-Δ transformer: 30 MVA , 11/220 kV, X= 15%

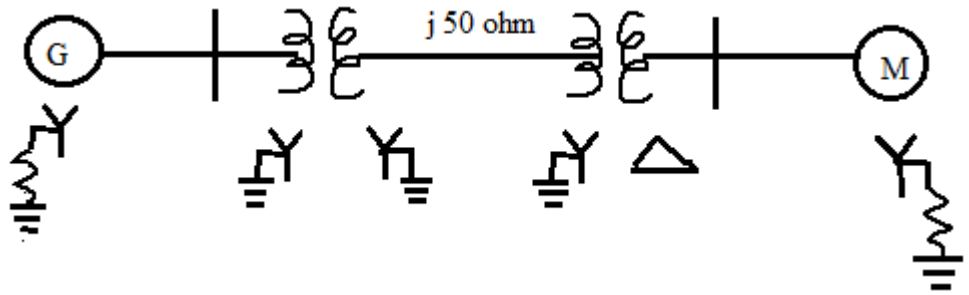

Fig.01

Q.6 a) Explain grading of underground cables (10)

b) Explain methods of neutral grounding (10)

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