17510

11819

3 Hours / 100 Marks Seat No. | | | | | | | | |

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Answer ***each*** *next main question on a* ***new*** *page.*
(3) Illustrate your answers with ***neat*** *sketches* ***wherever*** *necessary.*
(4) Figures to the ***right*** *indicate* ***full*** *marks.*
(5) Assume suitable data, if ***necessary****.*

Marks

1. A) Attempt **any three** : **12**

a) Draw neat diagram of basic structure of power system network.

b) State the need of reactive power compensation in power system.

c) "AC resistance is more than DC resistance". Justify.

d) List advantages of generalized circuit representation of transmission line.

B) Attempt **any one** : **6**

a) Draw circuit diagram for performing tests on transmission line model to measure generalised circuit constants. Also write stepwise procedure to perform the tests.

b) State the effect of earth on capacitance of transmission line.

2. Attempt **any two** : **16**

a) i) State generalised circuit constants expressions for medium transmission line considering 'T' and 'π' network.

ii) Prove that the complex power in power system is defined as S = VI* instead of S = V*I.

b) A 3-phase, 50 Hz, 100 km, 132 kV overhead line has conductors placed in a horizontal plane of 4.5 m apart. Conductor diameter is 22.4 mm, calculate capacitance per phase per km, capacitive reactance per phase, charging current per phase and total Mvars.

c) A 275 kV, 3-phase line has following line parameters A = $0.9\angle 1.5°$; B = $110\ \angle 75°$. It sending end voltage is 275 kV, determine

i) sending end power if load of 150 MW at 0.85 lagging p.f. is being delivered at receiving end.

ii) Maximum power at receiving end that can be delivered if sending end voltage is 295 kV with receiving end voltage at 275 kV.

P.T.O.

Marks

3. Attempt **any four** : **16**

a) Describe the importance of impedance diagram and reactance diagram of power system.

b) Describe stepwise procedure to draw receiving end circle diagram along with diagram.

c) A 20 km single phase line has two parallel conductors separated by 1.5 meters. The diameter of each conductor is 0.823 cm. If the conductor has resistance of 0.311 Ω/km, find loop impedance of the line at 50 Hz.

d) A 220 kV transmission line has following GCC : A = 0.85∠73°, B = 300∠78°. Determine receiving end active power if voltage at each end is maintained at 220 kV and unity p.f.

e) Describe concept of self GMR and self GMD in calculation of transmission line inductance with an example.

4. A) Attempt **any three** : **12**

a) State factors that influence skin effect.

b) A 3-phase 132 kV transmission line delivers 40 MVA at 0.8 p.f. lagging. Draw receiving end circle diagram and determine sending end voltage for A = 0.98∠3°, B = 140∠78°.

c) List the advantages of p.u. system.

d) Derive the condition for maximum power transferred (P_{Rmax}) at receiving end for a two port network.

B) Attempt **any one** : **6**

a) Prove that AD – BC = 1 for medium transmission line with T network.

b) Find self GMD for following arrangement of conductors with radius of each conductor as 'r' in Fig. 01.

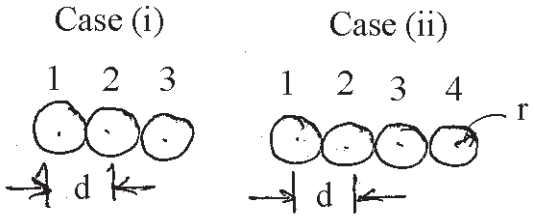

Fig. 01

Marks

5. Attempt **any two** : **16**

a) A 3 phase single circuit transmission line delivering a load of 50 MVA at 110 kV at 0.8 lagging p.f. with GCC A = D = 0.98∠3°, B = 110∠75°Ω, C = 0.0005∠80° siemens. Determine sending end voltage, sending end current, sending end p.f. and sending end power.

b) Along with diagram write stepwise procedure to draw sending end circle diagram. Also state data required to draw sending end circle diagram.

c) Calculate capacitance per phase and charging current of 3-phase system where conductors are placed at the corners of an equilateral triangle of sides 1.5 m each. The diameter of each conductor is 1.2 cm. Also calculate capacitance per phase and charging current if conductors are rearranged in horizontal line with spacing of 3 m between each conductor.

6. Attempt **any four** : **16**

a) A 132 kV, 50 Hz, 3 phase transmission line delivers no load at receiving end. Determine MVA rating of shunt reactor having negligible losses to maintain 132 kV at both ends of line. GCE for line are A = 0.95∠1.4°, B = 96∠78°, C = 0.0015∠90°.

b) A generator rated at 30 MVA, 11 KV has a reactance of 20% connected to a 3-phase, 50 MVA, 11/132 kV, Δ – Y transformer with X = 15%. Calculate its p.u. reactance of generator and transformer for a base of 50 MVA and 10 kV.

c) Derive the expression for flux linkages at an isolated current carrying conductor due to internal flux only.

d) State the importance of real power and reactive power in modern power system.

e) A medium transmission line of 3ϕ, 132 kV, 50 Hz have series impedance of (20 + j50)Ω and shunt admittance of 3.14×10^{-4} siemens per phase. Determine A, B, C, D constants of the line considering nominal 'π' network.