23242
3 Hours / 70 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.

(6) Use of Non-programmable Electronic Pocket Calculator is permissible.

(7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. Attempt any FIVE of the following : **10**

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

(b) List out the role of power system engineer.

(c) State the significance of resistance parameter on performance of transmission line.

(d) List out four factors affecting proximity effect.

(e) Give the expression for ABCD constant of T model.

(f) Determine ABCD constant of short transmission line having impedance (40 + j 100) Ω.

(g) Recall X and Y co-ordinates for centre of Receiving End Circle diagram.

2. Attempt any THREE of the following : **12**

(a) Develop a reactance diagram for structure of power system (Refer Fig. 1) considering generator as base.

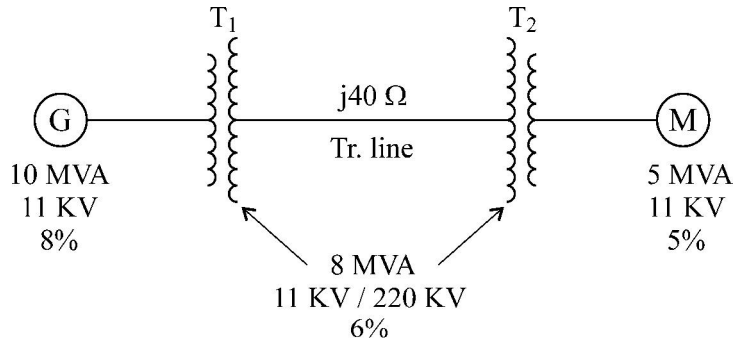

Fig. 1

(b) Calculate self GMD for following arrangements of conductors each having radius 'r' as shown in figures :

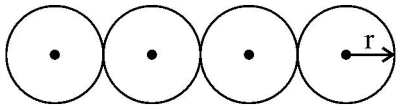

Fig. 2

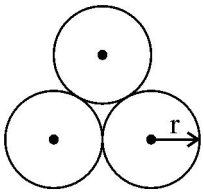

Fig. 3

(c) Determine the GCC for the resultant network of two networks connected in series.

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

3. Attempt any THREE of the following : **12**

(a) Draw equivalent circuit of alternator and transformer.

(b) Derive the expression for inductance of 3ϕ line with symmetrical arrangements.

(c) Define Generalized circuit constant ABCD. State its unit.

(d) A 275 kV 3ϕ line has following parameters :

$A = 0.91 \angle 1.5°$, $B = 115 \angle 77°$.

If the receiving end voltage is 275 kV, determine the maximum power that can be delivered if sending end voltage is held at 295 kV.

4. Attempt any THREE of the following : **12**

(a) State the field of application of reactive power compensation equipment given below :

(i) Shunt capacitor bank

(ii) Series inductance reactor

(iii) Synchronous condenser

(iv) Auto transformer

(b) Determine the inductance of 3ϕ line operating at 50 Hz & conductors are arranged at triangle of sides 1.6 m, 3.2 m and 1.6 m. The conductor diameter is 0.8 cm.

(c) List the advantages of generalised circuit representation.

(d) Derive the expression for complex power, active and reactive power at sending end.

(e) A 3ϕ 50 Hz line has resistance of 20 Ω, inductance of 0.2 H and capacitance of 1 μF. Determine ABCD constants of line considering π model.

5. Attempt any TWO of the following : **12**

(a) State the effect of earth on capacitance of transmission line.

(b) A 3ϕ 132 kV transmission line delivers 40 MVA at 0.8 pf lag. Draw receiving end circle diagram and determine sending end voltage for A = 0.98 ∠3°, B = 140 ∠78°.

(c) A 3ϕ line has following parameters, A = D = 0.9 ∠0.4°, B = 99 ∠76.86°, load angle is 9°. If sending end and receiving end voltages are maintained at 22 kV, calculate sending end complex power, active power and reactive power.

6. Attempt any TWO of the following : **12**

(a) A 132 kV, 50 Hz, 3-phase line delivers load at 40 MW, 0.8 p.f. lag, at receiving end. The GCC of line are A = 0.95 ∠1.4°, B = 96 ∠78°, C = 0.0015 ∠90°. Calculate sending end voltage, sending end current and voltage regulation. Use nominal T method.

(b) Write step by step procedure for drawing sending End Circle Diagram.

(c) A 250 kV transmission line has following GCC :

A = 0.85 ∠7°, B = 300 ∠75° Ω/phase.

Determine power at unity P.F. that can be received if voltage at each end is maintained at 250 kV.
