23124

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.

Marks

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

(a) Define Impedance diagram and Reactance diagram.

(b) Define Per Unit value.

(c) State the impact of inductance and resistance on transmission line performance.

(d) State the factors on which skin effect depends.

(e) Give the expression for A, B, C, D constants of "π" model.

(f) Determine A, B, C, D constants of short transmission line having impedance (10 + J25)Ω.

(g) Recall X and Y co-ordinates for center of receiving end circle diagram.

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

(a) Draw a single line diagram of power system.

(b) Calculate the self GMD of conductor shown in diagram.

Assume r = 0.1 cm

(c) Derive an expression for generalized circuit constants for two network connected in series.

(d) A 3 phase line has following parameters : A = 0.9 ∠1.5°, B = 100∠75°. If receiving end voltage is 220 kV and sending end voltage is 230 kV, then calculate maximum power that can be delivered.

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

(a) Summerise the Role of Power system engineer.

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

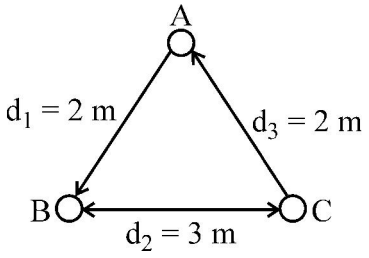
(c) Define Generalised circuit constants.

(d) Derive the condition for maximum power at receiving end.

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

(a) Give the stepwise procedure for drawing circle diagram at sending end.

(b) A 3 phase line operated at 50 Hz is arranged as shown in fig. The conductor diameter is 0.6 cm, find inductance per km.



d_1 = 2 m
d_2 = 3 m
d_3 = 2 m

(c) Write four advantages of Generalized circuit representation.

(d) A 275 kV, 3 phase line has the following line parameters

$A = 0.93\angle 1.5°$, $B = 115\angle 77°$

If the receiving end voltage is 275 kV, determine the sending end voltage required. If load of 250 MW at 0.85 lagging p.f. is being delivered at the receiving end.

(e) Prove that $AD - BC = 1$ for a generalized circuit with "π" Network.

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

(a) A 3 phase 50 Hz, 100 km, 132 kV overhead line has conductor placed in a horizontal plane of 4.5 m apart, conductor diameter is 22.4 mm. Calculate capacitance per phase per km and capacitive reactance per phase.

(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 $A = 0.98\angle 3°$, $B = 140\angle 78°$.

(c) A 3 Phase line has following parameters :

$A = D = 0.9\angle 1.5°$, $B = 110\angle 75°$

Load angle is 13°, if sending end and receiving end voltages are maintained at 275 kV.

Calculate sending end complex power and active power.

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

(a) A 200 kV transmission line has Generalized circuit constants $A = 0.86\angle 75°$, $B = 300\angle 75°$.

Calculate real power at unity p.f. that can be received if voltage at both end are maintained at 200 kV.

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(b) State the necessity of reactive power compensation equipment. List out the devices used for reactive power compensation and give application of each device.

(c) A 220 kV, 50 Hz, 3 ph overhead transmission line delivers a load of 75000 kW at 0.8 p.f. lagging at the receiving end and has following constants :

$A = D = 0.9\angle 0.6°$, $B = 153.2\angle 84.6°$ Ω (ohm) and $C = 0.0012\angle 90°$ Siemens

Calculate sending end parameters.

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