17510

14115

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.

(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.

(8) Use of Steam tables, logarithmic, Mollier's chart is permitted.

Marks

1. a) **Attempt any <u>THREE</u> of the following:** **12**

(i) Write any four advantages of ''per unit system''.

(ii) If $\overline{V} = 66 \angle -10°$ kV and $\overline{I} = 10 \angle -30°$ amp, then find active power, apparent power and reactive power, using complex power equation.

(iii) Write effect of resistance of transmission line on voltage regulation and efficiency.

(iv) Define is A, B, C, D constants referred to transmission line.

Marks

b) **Attempt any <u>ONE</u> of the following:** **06**

(i) If A_1, B_1, C_1, D_1 and A_2, B_2, C_2, D_2 are ABCD constants of two circuits. Find overall ABCD constants of resultant circuit, if these two circuits are connected in series.

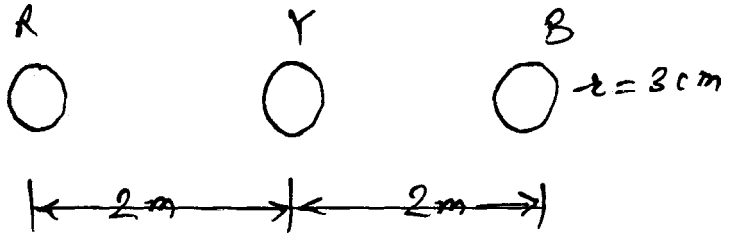
(ii) Explain each of the following terms self GMD, mutual GMD, significance of inductance in transmission line.

2. Attempt any <u>TWO</u> of the following: **16**

a) (i) Explain advantage of generalized circuit representation of transmission line in power system.

(ii) Explain what is circle diagram in power system.

b) Calculate inductanctive reactance per km. for the arrangement of three phase conductors shown below in Figure No. 1. Write assumption made during the calculations.



<u>Fig. No. 1</u>

c) A 220 kV 3 phase line has following parameters $A = 0.9 \angle 1.5°$, $B = 100 \angle 75°$. If the receiving end voltage is 220 kV, Determine -

(i) Sending end voltage if a load of 150 MW at 0.85 lagging of connected at the receiving end.

(ii) Maximum power that can be delivered if sending end voltage is 230 kV and receiving end voltage is 220 kV.

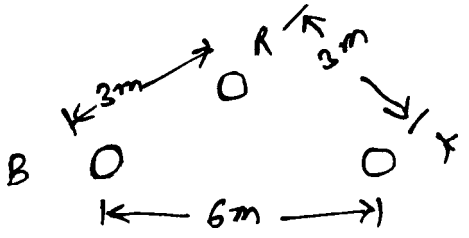
Marks

3. Attempt any <u>FOUR</u> of the following: **16**

a) If base voltage is 600 V and base apparent power is 100 kVA then find base impedence and base current.

b) Along with diagram, write different steps for drawing receiving end circle diagram.

c) Calculate inductance of a 3 phase line for the arrangement of conductors shown in Figure No. 2 below. The conductor diameter is 0.6 cm.



<u>Fig. No. 2</u>

d) A 220 kV transmission line has following generalised circuit constants A = 0.75 $\angle$ 65°, B = 250 $\angle$ 65°. Determine the power at unity power factor that can be received if the voltage at each end is maintained at 220 kV.

e) Explain how capacitance is formed in transmission line. Also explain significance of capacitance in performance of transmission line.

4. a) Attempt any <u>THREE</u> of the following: **12**

(i) Explain skin effect and proximity effect referred to line conductors.

(ii) A three phase 110 kV transmission line delivers 30 MVA at 0.8 pf lag. Draw receiving end circle diagram and find the sending end voltage. Given A = 0.90 $\angle$ 2°, B = 100 $\angle$ 70°.

(iii) Explain the need of power system is analysis.

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

Marks

b) **Attempt any <u>ONE</u> of the following:** **06**

(i) Explain how generalised circuit constants of a transmission line is measured, which is connected in the system.

(ii) Explain difference between magnitude of inductance in solid conductor and magnitude of inductance in bundled conductor.

5. Attempt any <u>TWO</u> of the following: **16**

a) Prove AD – BC = 1 where A, B, C, D are generalized circuit constants of a medium transmission line.

b) Along with diagram write procedure for drawing sending end circle diagram.

c) A three phase 400 kV, 500 km transmission line has following parameters

resistance = 0.025 ohm/km/phase

inductance = 1 mH/km/phase

capacitance = 0.020 μF/km/phase

Calculate ABCD constants. Use nominal π method.

6. Attempt any <u>FOUR</u> of the following: **16**

a) A 400V, 50Hz, 3 phase line delivers 100 kW at 0.85 pf lagging. If power factor of this line is to be increased to 0.95 lagging, then calculate value of shunt capacitances if they are connected in

(i) star

(ii) delta

b) Write any eight functions that a power system engineer has to perform.

c) Write meaning of each of following terms internal flux, external flux, flux linkage, isolated conductor.

d) State the advantages of circle in power system analysis.

e) A short transmission line has series impedence of $(10 + j25)\Omega$. Calculate A, B, C, D generalised circuit constants.

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