17510

15162

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

Instructions : *(1)* ***All*** *questions are* ***compulsory****.*
(2) Illustrate your answers with neat sketches ***wherever*** *necessary.*
(3) Figures to the ***right*** *indicate* ***full*** *marks.*
(4) Assume suitable data, if ***necessary****.*
(5) Use of Non-programmable Electronic Pocket Calculator is ***permissible****.*
(6) Mobile Phone, Pager and any other Electronic Communication devices are ***not*** *permissible in Examination Hall.*

Marks

1. A) Attempt **any three** of the following : **12**
a) Explain the role of a power system engineer in operation of power system.
b) What is proximity effect ? State the factors on which it depends.
c) Explain the concept of circle diagram.
d) Derive generalized circuit constants of two networks connected in parallel.

B) Attempt **any one** of the following : **6**
a) Explain the concept of self G.M.D. and mutual G.M.D. in the calculation of transmission line inductance.
b) For a generalised circuit prove that AD – BC = 1.

2. Attempt **any two** of the following : **16**
a) A single 3-phase line operated at 50 Hz is arranged as shown in Fig. No.1. The conductor diameter is 0.6 cm. Find the inductance and capacitance per km. The line is regularly transposed.

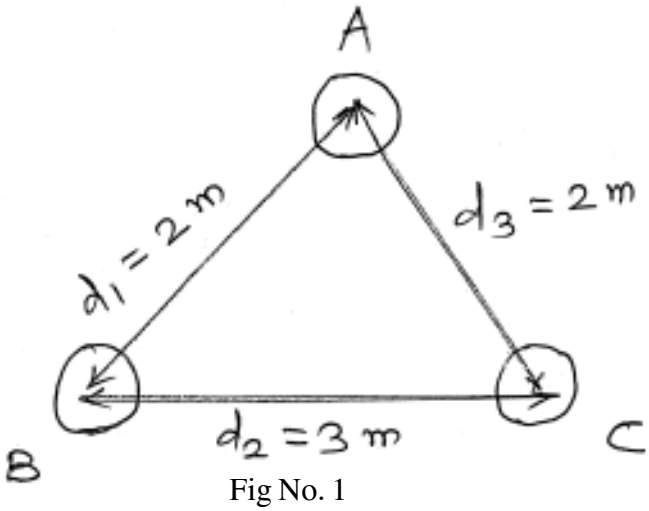

Fig No. 1

P.T.O.

Marks

b) Derive the equation of a receiving end power circle diagram in terms of general circuit constants. Show how this diagram can be used to determine the maximum power that can be transmitted under given operating condition.

c) Draw a single line labelled diagram and reactance diagram showing the essential components of modern power system.

3. Attempt **any four** of the following : **16**

a) Obtain the equation for complex power at sending end of transmission line.

b) A 3-phase overhead transmission line has a total series impedance per phase of $200 \angle 80°$ ohms and total shunt admittance of $0.0013 \angle 90°$ siemen per phase. Determine the value of A and B constants.

c) Explain the effect of temperature on transmission line resistance.

d) Explain what is a bundled conductor and why is it used.

e) Calculate the capacitance of a 100 km long 3-phase, 50 Hz overhead transmission line consisting of three conductors, each of diameter 2 cm spaced 2.5 m at the corners of equilateral triangle.

4. A) Attempt **any three** of the following : **12**

a) Write the equation for converting the per unit impedance expressed in one base to another. List the two advantages of per unit computation.

b) Obtain the expression for flux linkages of an isolated current carrying conductor due to internal flux only.

c) A simple circuit of Fig. No. 2 consists of single shunt admittance. Find the A, B, C, D constants from fundamental formulae.

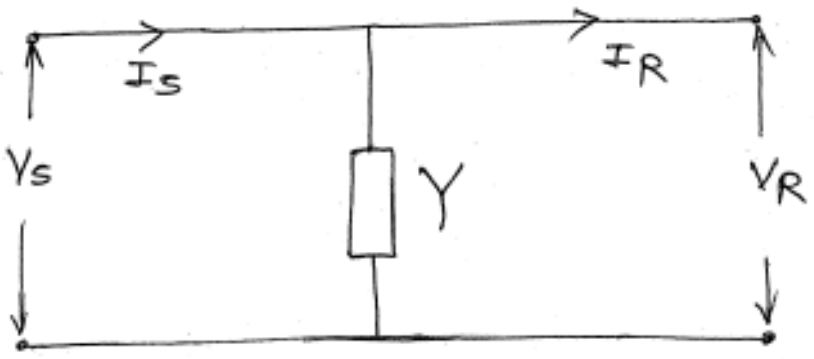

Fig. No. 2

d) Express real and reactive power at receiving end in terms of V_S, V_R and transmission line constants. Mention the meaning of each nomenclature.

B) Attempt **any one** of the following : **6**

a) i) Write significance of capacitance in transmission line.

ii) Explain the difference between AC resistance and DC resistance. (any three point).

b) A 132 kv three phase line has the following line constants : $A = 0.9 \angle 2.5°$, $B = 100 \angle 70°$ ohm, $C = 0.0006 \angle 80°$ siemen. Draw the receiving end power circle for a 40 MW at 0.8 power factor lagging at the receiving end and find the sending end voltage.

Marks

5. Attempt **any two** of the following : **16**

a) i) Explain skin effect. State different factors on which it depends.

ii) Derive the expression for inductance of three phase line (single circuit) composed of solid conductors with symmetrical spacing.

b) i) Write four advantages of generalized circuit representation.

ii) Explain how ABCD constant are measured for a transmission line.

c) A 220 Kv, 50 Hz, 3-phase overhead transmission line delivers a load of 75,000 kW at 0.8 p.f. lagging at the receiving end and has the following constants :

$A = D = 0.9 \angle 0.6°$; $B = 153.2 \angle 84.6°$ ohm and $C = 0.0012 \angle 90°$ S calculate the sending end parameters.

6. Attempt **any four** of the following : **16**

a) Explain the stepwise procedure for drawing receiving end circle diagram.

b) Compare short and long transmission line (any four point).

c) Explain the effect of inductance on performance of the transmission line.

d) Write four advantages of circle diagram.

e) Draw and explain medium transmission line.
