

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:2160908

Date:03/06/2022

Subject Name:Electrical Power system – II

Time:10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed

| | MARKS |
|---|--------------|
| Q.1 (a) How are lines classified as short, medium and long transmission lines? What aspects you need to consider while modeling and carrying out performance analysis of these lines? | 03 |
| (b) What are symmetrical components? With the help of vector diagram, explain the relationship between phase voltages and voltages of symmetrical components. | 04 |
| (c) What is corona phenomena in transmission lines? Explain the factors affecting corona. State some of the methods to reduce corona. On which type of transmission line, corona losses would be more if we consider all other parameters to be same for 50 Hz and 60 Hz transmission line? | 07 |
| Q.2 (a) Differentiate between shunt faults and series faults. Give examples of the same. | 03 |
| (b) Prove that velocity of transient travelling in underground cable is much less than overhead transmission line | 04 |
| (c) A transmission line having a length of 200 km has the following constants: Resistance/km = 0.15 Ω /phase, Reactance/km = 0.50 Ω /phase, Susceptance/km = 2×10^{-6} mhos. Voltage at the receiving end is 132 kV. If the transmission line is delivering 50 MVA at 0.8 pf lagging calculate (i) sending end voltage (ii) sending end current (iii) line efficiency. Use nominal T-method. | 07 |
| OR | |
| (c) Using rigorous solution method, derive the expression for A,B,C,D constants for long transmission line | 07 |
| Q.3 (a) With the help of vector diagram, derive the approximate value of sending end voltage for short transmission line. | 03 |
| (b) A 3- Φ , 50 Hz, 500 km long transmission line has the following line constants per phase per km uniformly distributed: $r = 0.44 \Omega$, $x =$ | 04 |

0.9Ω , $g = 8 \times 10^{-9}$ mhos, $b = 5.06 \times 10^{-6}$ mhos. Determine the line constants 'A' and 'B'

- (c) Derive the equations for power flows (P_R , Q_R , P_S , Q_S) through a transmission line **07**

OR

- Q.3** (a) What is meant by X''_d , X'_d and X_d ? Which one has lowest value? **03**
 (b) Discuss the criteria for selection of circuit breakers **04**
 (c) For the network shown in figure-1, 3-phase fault occurs at point F. Determine the fault current and line voltage and 11 kV bus under fault conditions **07**

- Q.4** (a) Draw the zero sequence reactance diagram for the network shown in figure 2 **03**
 (b) Find the symmetrical currents for the given three phase currents: $I_a = 10/0^\circ$, $I_b = 10/-90^\circ$, $I_c = 15/135^\circ$ **04**
 (c) Derive the expressions for positive, negative and zero sequence impedances of a fully transposed three phase balanced transmission line **07**

OR

- Q.4** (a) Show that symmetrical component transformation is power invariant. **03**
 (b) At a 220 kV bus of a power system it is given that three phase fault level is 4000 MVA. Neglecting resistance and shunt susceptances of the system, find the positive sequence driving reactance at the bus in ohms. **04**
 (c) Derive the expression for fault current due to LLG fault at the generator terminals **07**

- Q.5** (a) State the disadvantages of corona **03**
 (b) Explain over voltages generated due to arcing ground phenomena **04**
 (c) Derive the expression for attenuation of a travelling wave **07**

OR

- Q.5** (a) Which fault would be more severe at the terminals of a solidly grounded generator? Justify your answer **03**
 (b) Explain the procedure for finding the centre and radius of receiving end power circle diagram **04**
 (c) Derive the expression for co-efficient of reflection and refraction for a transmission line having surge impedance Z_0 terminated by resistance R **07**

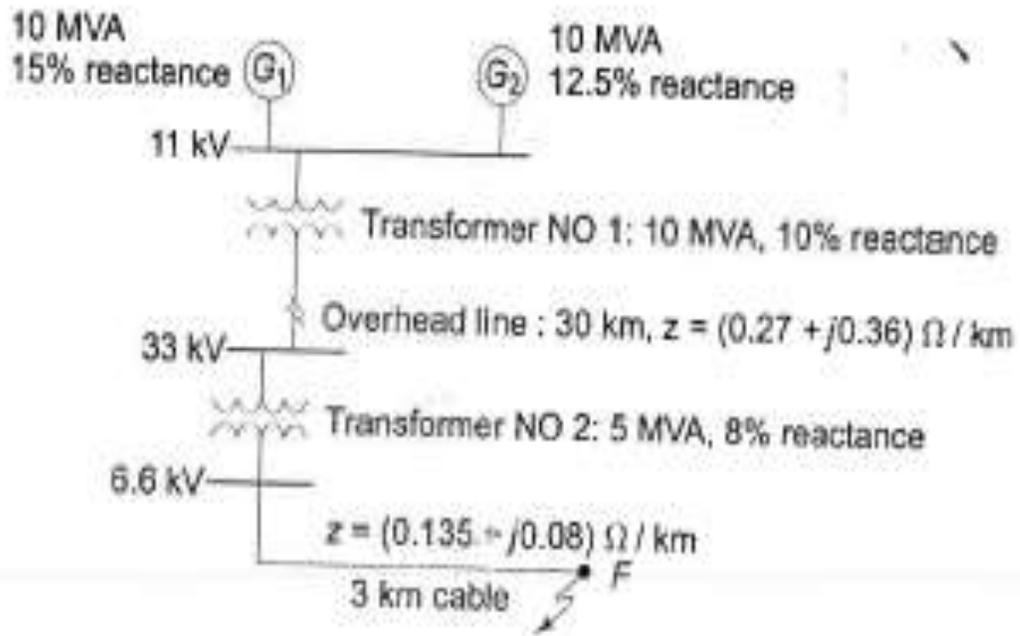


Fig 1

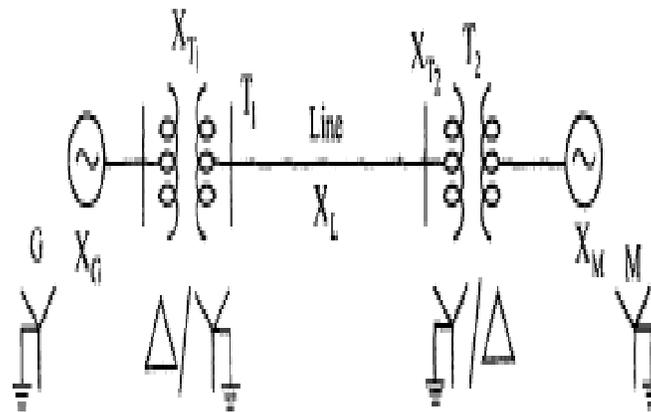


Fig 2
