



SE-8276

B. E. III (Sem. V) (Elect.) Examination
May / June – 2011
Power System Analysis & Simulation
(New Course)

Time : 3 Hours]

[Total Marks : 100

Instructions :

(1)

नीचे दशावेक निशानीवाणी विगतो उत्तरवडी पर अवश्य कपवी. Fillup strictly the details of signs on your answer book.	Seat No. :
Name of the Examination :	<input type="text"/>
<input type="text" value="B. E. 3 (Sem. 5) (Elect.)"/>	<input type="text"/>
Name of the Subject :	<input type="text"/>
<input type="text" value="Power System Analysis & Simulation"/>	<input type="text"/>
Subject Code No. : <input type="text" value="8"/> <input type="text" value="2"/> <input type="text" value="7"/> <input type="text" value="6"/>	<input type="text"/>
Section No. (1, 2,.....) : <input type="text" value="1&2"/>	<input type="text"/>
	Student's Signature

- 1) Attempt all questions.
- 2) Make suitable assumptions where ever necessary.
- 3) Figures to the right side indicate Full marks.

Q-1 a **Answer in brief:** (15)

- 1 Advantages of per unit presentation.
- 2 Enumerate the positions in which reactors may be connected.
- 3 Explain the physical interpretation of negative sequence currents.
- 4 Discuss briefly types of reactors.
- 5 Advantages of tie bar system over ring system.

b **Pick up the correct words/figures from the brackets and fill in the blanks.** (05)

- 1 _____ fault gives rise to symmetrical fault currents. (single phase to ground, phase to phase, 3-phase short circuit)
- 2 If the % age reactance of the system up to the fault point is 20% & the base kVA is 10,000, then short circuit kVA is _____. (50000, 10000, 2000)
- 3 The use of reactors permits installation of circuit breaker of _____ ratings. (lower, higher)
- 4 A 20,000 kVA transformer with 10% reactance will have a reactance of _____ at 10,000 kVA base. (5%, 20%, 10%)
- 5 A symmetrical fault on a power system is _____ severe than an unsymmetrical fault. (more, less)

Q:2 a How are per unit impedances obtained for 3-phase system? Also mention advantages of per unit system? (06)

b A3-phase transmission line operating at 10 kV and having a resistance of 1Ω and reactance of 4Ω is connected to the generating station bus-bars through 5 MVA step-up transformer having a reactance of 5%. The bus bars are supplied by a 10 MVA alternator having 10% reactance. Calculate the short circuit kVA fed to symmetrical fault between phases if it occurs (i) at the load end of the transmission line (ii) at the high voltage terminals of the transformer. (08)

OR

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[Contd...

Q:3 **Attempt any two:** (16)

- 1 Derive an expression of fault current for single line to ground fault by symmetrical component method.
- 2 Derive an expression of sending end voltage V_s , sending end current I_s for nominal T method (medium transmission line) with the aid of vector diagram.
- 3 Discuss the calculation of L-L-G fault using symmetrical components.

Q:4 a What is effect of load p.f. on regulation & efficiency of transmission line. (03)

b Explain the following: (06)

- 1 Critical disruptive voltage
- 2 Visual critical voltage
- 3 Power loss due to Corona.

c A 100-km long, 3-ph, 50 Hz transmission line has following line constants: (07)

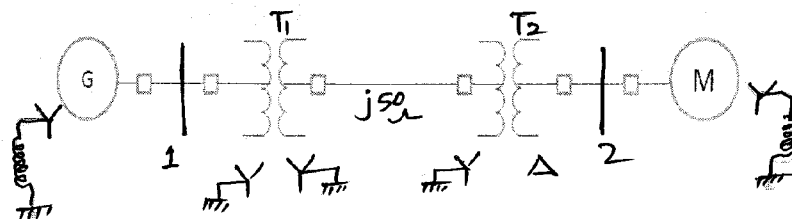
Resistance/phase/km= 0.1Ω
 Reactance/phase/km= 0.5Ω
 Susceptance/phase/km= $10 \times 10^{-6} S$.

If the line supplies load of 20 MW at 0.9 p.f. lagging at 66 kV at receiving end, calculate by nominal Π method: (i) sending end power factor (ii) regulation (iii) Transmission efficiency.

Q:5 a A 3-ph line delivers 3600 kW at a p.f. 0.8 lagging to a load. If the sending end voltage is 33 kV, determine (i) receiving end voltage (ii) line current (iii) transmission efficiency. The resistance and reactance of each conductor are 5.31Ω & 5.54Ω respectively (06)

b Draw the per unit impedance diagram for the power system as shown in figure (i). Neglect resistance and use a base of 100 MVA, 220 kV in 50 Ω line. The ratings of generator, motor and transformer are: (10)

Generator : 40 MVA, 25 kV, $X=20\%$
 Motor: 50 MVA, 11 kV, $X=30\%$
 Y-Y Transformer: 40 MVA, 33 Y-220 Y kV $X=15\%$
 Y- Δ Transformer 30 MVA, 11 Δ - 220 Y kV $X=15\%$

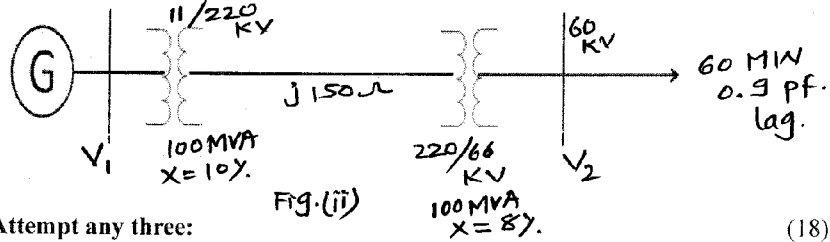


OR

Q:5 a. A 3-phase, 50 Hz, 16 km long overhead line supplies 1000 kW at 11 kV, 0.8 p.f. lagging. The line resistance is 0.03Ω per phase per km and line inductance is 0.7 mH per ph per km. Calculate sending end voltage, voltage regulation and efficiency of transmission. (06)

b. Fig (ii) shows the schematic diagram of a radial transmission system. The ratings and reactances of the various components are shown therein. (10)

A load of 60 MW at 0.9 pf lag is tapped from 66 kV sub station which is to be maintained at 60 kV. Calculate terminal voltage of synchronous machine. Represent transmission line and transformers by series reactances only.



Q:6 Attempt any three:

(18)

1. Derive an expression of sending end voltage V_s , sending end current I_s for nominal π method (medium transmission line) using vector diag.
2. Explain the factors affecting corona.

A 3- phase line has conductors 2 cm in diameter spaced equilaterally 1m apart. If dielectric strength of air is 30 kV (max) per cm., find the disruptive critical voltage for the line. Take air density factor $\delta = 0.952$ and irregularity factor $m_0 = 0.9$

3. A 3- phase 50 Hz, 150 km line has a resistance, inductive reactance and capacitive shunt admittance of 0.1Ω and $3 \times 10^{-6} S$ per km per ph. If the line delivers 50 MW at 110 kV and 0.8 pf lagging, determine the sending end voltage and current. Assume a nominal π circuit of the line.
4. Discuss the calculation of L-G faults using symmetrical components.