

Total No. of Questions : 12]

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SEAT No. :

P890

[Total No. of Pages : 4

[4263] - 256

T.E. (Electrical)

POWER SYSTEMS - II

(2008 Pattern) (Semester - II)

Time : 3 Hours]

[Max. Marks : 100

Instructions to the candidates:

- 1) Answer any three questions from each section.
- 2) Answers to the two sections should be written in separate answer books.
- 3) Figures to the right indicate full marks.
- 4) Use of scientific calculator is allowed.

SECTION - I

- Q1) a) Show how receiving end power circle diagram of a transmission line based on generalized constants (A, B, C, D) can be drawn. Also show how power at the receiving end can be calculated for any torque angle from such a diagram. [8]
- b) A 3-ph, 132 kV line delivers 45 MW at 0.8pf lagging using power circle diagram find, [10]
- i) Sending End Voltage.
 - ii) Capacity of synchronous condenser required if sending voltage is increased to 180kV
 - iii) Capacity of synchronous condenser needed at no-load if both sending and receiving end voltages are 132 kV.

The line constants are $A = 0.9 \angle 2.5^\circ$, $B = 100 \angle 70^\circ$

OR

- Q2) a) What is line compensation? Why it is necessary? Compare static capacitors and synchronous compensators. [8]
- b) A 275 kV transmission line has the following line constants, $A = 0.85 \angle 5^\circ$
 $B = 200 \angle 75^\circ$. [10]
- Determine the power at unity p.f. that can be received if the voltage profile at each end is to be maintained at 275kV.
 - What type and rating of compensation equipment would be required if the load is 150 MW at unity p.f. with same voltage profile i.e. 275kV.

- Q3) a) Discuss the factors and conditions affecting corona loss. [8]
- b) A 3ph overhead line consists of 3 conductors in equilateral formation with 2.44m spacing. The conductor diameter is 1.04 cm and surface factor (m) is 0.85. The air temperature and pressure are 21.1°C and 74 cm of mercury. Find the visual corona voltage. [8]

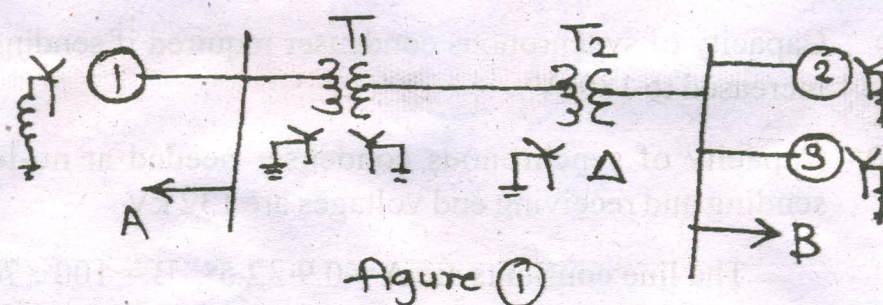
OR

- Q4) a) What is meant by corona? Why does it occur? What is the difference between visual critical voltage and disruptive critical voltage. [8]
- b) A 3ph, 220 kV 50Hz, 250 km long line consisting of 22.26 mm diameter conductors spaced in a 6 m delta configuration. [8]

The temperature is 25°C , pressure 73 cm of mercury, surface factor 0.84, irregular factor for local corona 0.72, irregular factor for general corona 0.82.

Find the total loss in fair weather condition using Peek's formula.

- Q5) a) Obtain the per unit impedance (reactance) diagram of the power system of figure 1. [8]



- b) Explain advantages and application of per unit system. [8]

OR

Q6) a) Explain sudden 3-phase short-circuit analysis of an unloaded alternator. [8]

b) A 25 MVA, 11 kV generator with $X_d'' = 20\%$ is connected through a transformer, line and a transformer to a bus that supplies three identical motors as shown in figure 2. Each motor has $X_d'' = 25\%$ and $X_d' = 30\%$ on a base of 5 MVA, 6.6 kV. The three phase rating of T_1 is 25 MVA, 11/66 kV with a leakage reactance of 10% and T_2 is 25 MVA, 66/6.6 kV with leakage reactance of 10%. The bus voltage at the motors is 6.6 kV when a three phase fault occurs at point F, for the specified fault, calculate [8]

- The subtransient current in the fault.
- The subtransient current in the breaker B.

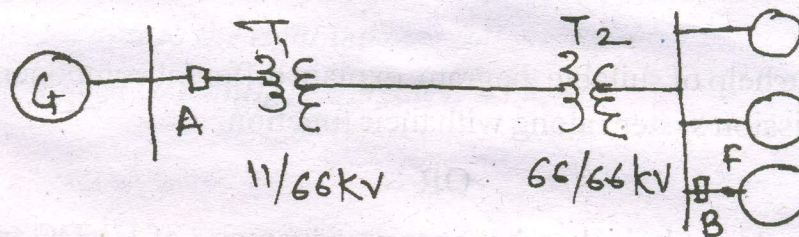


fig. (2)

SECTION - II

Q7) a) A delta connected balanced resistive load is connected across an unbalanced three phase supply. The line currents are $I_R = 10 \angle 30^\circ$, $I_Y = 15 \angle -60^\circ$ and $I_B = 18 \angle 154^\circ$. Find the symmetrical components of line currents and phase currents. The value of resistance is $3R$ ohm per phase. [10]

b) Show that fault current $I_f = \frac{3E}{Z_1 + Z_2 + Z_0}$ when L-G fault occurs at the terminals of solidly grounded star connected alternator. [8]

OR

Q8) a) Derive the expression for fault current of an alternator, with sequence diagram in following types of faults. [12]

- Line to line fault
- Double line to ground fault

- b) Draw the equivalent circuit for zero sequence reactance of three phase transformer, for different combinations of connections. [6]

- Q9) a) Explain the step by step method of formation of Y_{bus} matrix. [8]
b) Explain Newton Raphson method of load flow analysis along with flowchart. [8]

OR

- Q10) a) Give classification of various types of buses in power system for load flow studies. What is the significance of reference bus? [6]
b) Derive static load flow equation for 'n' bus system [10]

- Q11) a) Explain constant ignition control method for HVDC transmission system. [8]
b) With the help of suitable diagram, explain different component of HVDC transmission system along with their function. [8]

OR

- Q12) a) Discuss the technical and economic advantage of HVDC transmission system over HVAC transmission system. [8]
b) What are the recent developments in HVDC transmission system? Discuss future scope of HVDC transmission system in India. [8]

