Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) - EXAMINATION – SUMMER 2016

Subject Code:2160908 **Date:09/05/2016**

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.**

Q.1 (a) Derive the ABCD constants for medium transmission line using Nominal Π representation. Also write the expressions for voltage regulation and efficiency for the same line.

(b) A 3-phase. 50-Hz overhead transmission line 100 km long has the following constants.
Resistance/km/phase = 0.1 Ω
Inductive reactance/km/phase = 0.2 Ω
Capacitive susceptance/km/phase = 0.04×10^{-4} siemen
Determine (i) the sending end current (ii) sending end voltage (iii) sending end power factor and (iv) transmission efficiency when supplying a balance load of 10,000 kW at 66 kV p.f 0.8 lagging . Use nominal T method.

Q.2 (a) Explain in brief transients in RL series circuits (Doubling effect).

(b) A synchronous generator and synchronous motor each rated 25 MVA ,11 kV having 15 % sub transient reactance are connected through transformers and a line shown in fig. 1. The transformers are rated 25 MVA , 11/66 kV and 66/11 kV with leakage reactance of 10 % each. The line has reactance of 10 % on a base of 25 MVA ,66 kV. The motor is drawing 15 MW at 0.8 power factor leading and terminal voltage of 10.6 kV when a symmetrical three phase fault occurs at motor terminals. Find the subtrensient current in the generator motor and fault.

OR

(b) A 25 MVA, 11 kV generator with $X_d'' = 20$ % is connected through a transformers , line and a transformers to a bus that supplies three identical motor as shown in fig. 2. Each motor has $X_d'' = 25$ % and $X_d' = 30$ % on a base of 5 MVA , 6.6 kV . Three phase rating of the step up transformers is 25 MVA , 11/66 kV with leakage reactance of 10 % and that of the step down transformer is 25 MVA , 66/6.6 kV with a leakage reactance of 10 %. The bus voltage at the motors is 6.6 kV when a three –phase fault occurs at the point F. For the specified fault, calculate.

(a) The subtransient current in the fault ,
(b) The subtransient current in breaker B,
(c) The momentary current in breaker B.

Q.3 (a) Derive the expressions of positive, negative and zero sequence voltage components in terms of given set of unbalance voltage phasors Va ,Vb and Vc. Also write similar current equation.

(b) The currents in three phase unbalanced system are Ia =(12 + j6), Ib = (12 - j12), Ic = (- 15 + j10) A. The phase sequence is abc. Calculate, positive , negative and zero sequence components of current.

OR

Q.3 (a) Derive expression of power in terms of symmetrical components.

(b) In a three phase four wire system the currents in line a, b and c under abnormal condition are Ia = 100 ∠ 30 º A ,Ib =50 ∠ 300 º A , Ic=30 ∠ 180 º A. Calculate the zero positive and negative phase sequence currents in line a and return current in the neutral conductor.

Q.4 (a) Drive analysis of single line to ground fault at a point of power system using symmetrical components and sequence network.

(b) A 3 phase , 11kV, 25 MVA generator with Xo = 0.05 p.u, X1 = 0.2 p.u and X2 = 0.2 p.u is grounded through a reactance of 0.3 Ω .Calculate fault current for a single line to ground fault.

OR

Q.4 (a) What is 3 phase unsymmetrical fault ? Discuss the different types of unsymmetrical in brief.

(b) One conductor of a 3 phase line is open as shown in fig. 3. The current flowing to the Δ connected load through the line R is 10 A. With the current in line R as reference and assuming that line B is open , find the symmetrical components of the line currants.

Q.5 (a) Explain travelling waves of transmission line when receiving end is short circuited.

(b) Write a brief note on capacitance switching.

OR

Q.5 (a) Describe the phenomenon of corona in brief. Also explain factor affecting corona.

(b) Define transient . Explain in brief restrikting voltage after removal of short circuits.

Q-2 (b)

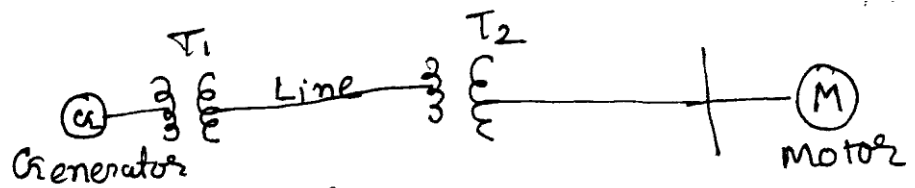

Figure-1

Q-2 (b) OR

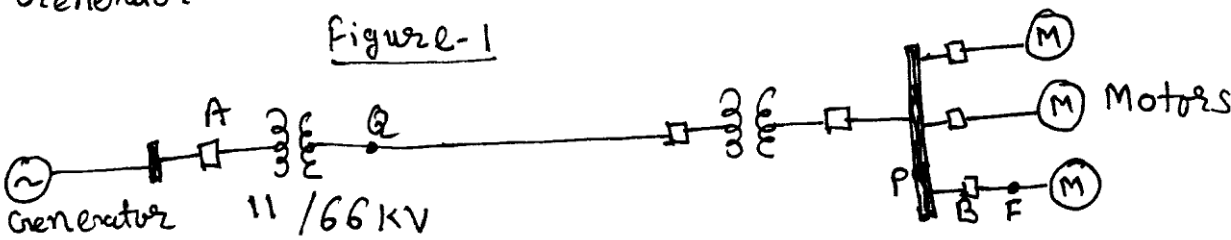

Figure-2

OR

Q-4 (b)

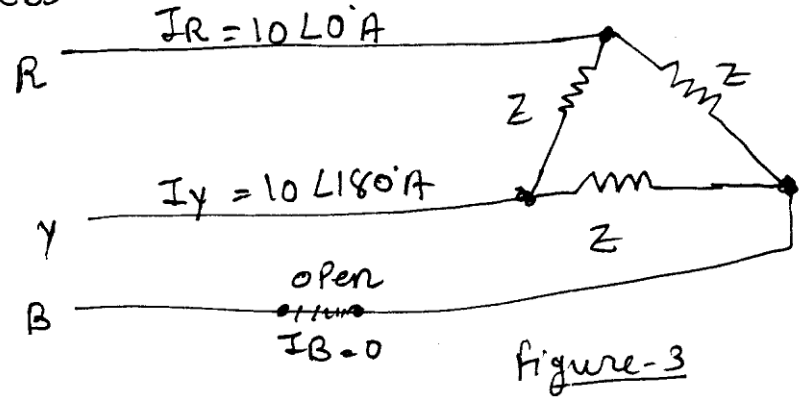

Figure-3

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