Seat No.: ________ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–V (Old) EXAMINATION – WINTER 2019

Subject Code: 150902 **Date: 06/12/2019**

Subject Name: Power System Analysis And Simulation

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 equivalent- π circuit of a long transmission line. **07**

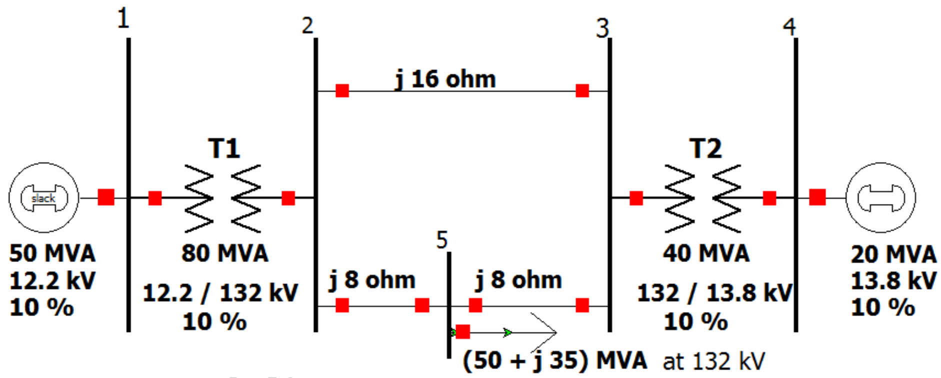
(b) A three phase, 60 Hz transmission line, 130 Km long delivering 270 MVA at 325 kV & a 0.8 p.f. lagging. The resistance & inductance of the lines per phase per km are 0.036 Ω & 0.8 mH respectively, While capacitance is 0.0112 μF / km / phase. Using Nominal-T method. **07**
Calculate:
(1) Sending end Voltage (2) Sending end Current (3) Voltage regulation and
(4) Line efficiency.

Q.2 **(a)** Write a brief note on selection of circuit breakers. **07**

(b) Explain in brief transients in RL series circuits **07**

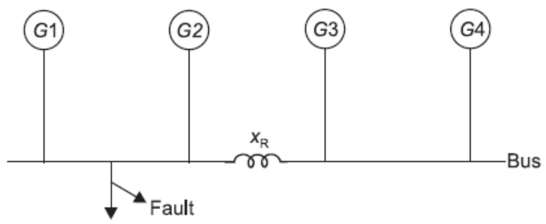
OR

(b) Draw the reactance diagram & mark all reactance in per unit. Choose 12.2 kV as a base for generator & 50 MVA. **07**



Q.3 **(a)** Derive the necessary equations to convert: (i) phase quantities into symmetrical components (ii) symmetrical components in to phase quantities. **07**

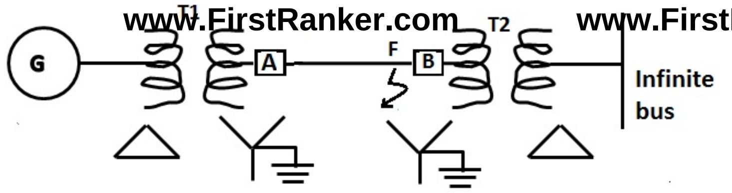
(b) Figure shows a system having four synchronous generators each rated 11.2 kV, 60 MVA and each having a subtransient reactance of 16%. Find (a) fault level for a fault on one of the feeders (near the bus with $X_R = 0$). (b) The reactance of the current limiting reactor X_R to limit the fault level to 860 MVA for a fault on one of the feeders near the bus. **07**



OR

Q.3 **(a)** Prove that zero impedance of fully transposed transmission lines is always higher than positive and negative sequence impedances. **07**

(b) The System shown in Fig. is delivering 50 MVA at 11 kV, 0.8 lagging power factor into a bus which may be regarded as infinite. **07**



Generator: 60 MVA, 12 kV, X'_d=35%
Transformer (each): 80 MVA, 12/66 kV, X=8%
Line: X=12 Ω
Calculate the symmetrical current that the circuit breaker A and B will be called upon to interrupt in the event of a three phase fault occurring at F near the circuit breaker B.

Q.4 **(a)** Explain line to ground fault on an unloaded generator using symmetrical components. **07**

(b) A 25 MVA, 11 kV generator has X_1 = 0.2 p.u., X_2 = 0.3 p.u. and X_0 = 0.1 p.u.. The neutral of the generator is solidly grounded. Determine the sub-transient current in the generator and the line-to-line voltages for sub-transient condition when a Y-B fault occurs at the generator terminals. Assume pre-fault currents and fault-resistance to be zero. **07**

OR

Q.4 **(a)** Derive an expression for fault current for double line-to-ground fault by symmetrical components method. **07**

(b) A three phase, 37.5 MVA, 33 kV alternator having X_1 = 0.18 pu, X_2 = 0.12 pu and X_0 = 0.10 pu, based on its ratings, is connected to a 33 kV overhead line having X_1 = 6.3 ohms, X_2 = 6.3 ohms and X_0 = 12.6 ohms per phase. A single line to ground fault occurs at the remote end of the line. The alternator neutral is solidly grounded. Calculate fault current. **07**

Q.5 **(a)** Explain the need of neutral grounding of system. Describe any one method of neutral grounding. **07**

(b) A grid line operating at 132 kV consists of 2 cm diameter conductors spaced 4 meters apart. Determine the disruptive critical voltage and visual corona voltage for the following data: Temperature 44°C, barometric Pressure 73.7 cm of mercury, conductor surface factor 0.84, fine weather 0.8 and rough weather 0.66. **07**

OR

Q.5 **(a)** Briefly discuss the factors affecting Corona. **07**

(b) Explain the phenomena of arcing grounds. How does neutral grounding eliminate the arcing ground? **07**

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