

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI (NEW) EXAMINATION – WINTER 2023****Subject Code:2160908****Date:05-12-2023****Subject Name:Electrical Power system – II****Time:02:30 PM TO 05:00 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) Give classification of transmission line. Also define (i) voltage regulation and (ii) efficiency for transmission line.	03
	(b) A short 3-phase transmission line connected to 33 kV generating station at the sending end is to supply a load of 10 MW at 0.8 power factor lagging at 30 kV at the receiving end. If the minimum transmission efficiency is to be 0.96, determine the per phase values of line resistance and reactance.	04
	(c) What is nominal circuit? Derive ABCD constants of medium transmission line for nominal T circuit.	07
Q.2	(a) Give classification of faults in a power system. Which fault is most severe? Justify your answer.	03
	(b) A circuit breaker is rated as 2000 A, 2000 MVA, 33 kV, 4 seconds. Determine (i) rated symmetrical breaking current (ii) rated making current (iii) short time rating and (iv) rated voltage and normal current of circuit breaker.	04
	(c) What is the modification of Z_{bus} if one branch is removed from original network? Deduce the expression for modification of Z_{bus} after elimination of fictitious branch.	07
	OR	
	(c) Write short note: Selection of circuit breaker	07
Q.3	(a) What are symmetrical components? Why they are necessary?	03
	(b) Draw zero sequence network of a	04
	(i) Y-Y transformer bank, both neutral grounded	
	(ii) Y-Δ transformer bank with grounded Y neutral	
	(iii) Y-Δ transformer bank with ungrounded Y neutral and	
	(iv) Δ-Δ transformer bank with grounded Y neutral	
	(c) The phase currents of an unbalanced three phases network is $I_a = 10\angle 15^\circ$ A, $I_b = 15\angle 75^\circ$ A, and $I_c = 12\angle -90^\circ$ A. Calculate the symmetrical components of the currents.	07
	OR	
Q.3	(a) Draw the zero-sequence network of a generator when the neutral is (i) solidly grounded (ii) grounded with Z_n and (iii) ungrounded.	03
	(b) One line diagram of a power system is given below. Draw positive, negative and zero sequence network of it.	04



- (c) The symmetrical components of an unbalanced power system are $I_{a0} = 35\angle 90^\circ$ A, $I_{a1} = 50\angle -45^\circ$ A and $I_{a2} = 60\angle 0^\circ$ A. Calculate the phase current of the network. **07**
- Q.4** (a) What is a 3-phase unsymmetrical fault? Discuss the different types of unsymmetrical faults that occurs in a 3-phase system. **03**
- (b) Why the neutral grounding impedance Z_n appears as $3Z_n$, in the zero sequence equivalent circuit. **04**
- (c) A 30 MVA, 11 kV generator has $Z_1 = Z_2 = j0.2$ pu, $Z_0 = j0.05$ pu. A double line to ground fault occurs on the terminals of generator. Determine the line currents, fault current and line to neutral voltages under fault conditions **07**
- OR**
- Q.4** (a) Why a single line to ground fault is generally more severe than a 3-phase fault at an alternator terminals. **03**
- (b) What do you understand by sequence networks? What is their importance in unsymmetrical fault calculation? **04**
- (c) A 50 MVA, 11 kV, 3-phase alternator was subjected to different types of faults. The fault currents were: (i) 1870 A for 3-phase fault, (ii) 2590 A for line to line fault and (iii) 4130 A for single line to ground fault. The alternator neutral is solidly grounded. Find the per unit values of the three-sequence reactance of the alternator. **07**
- Q.5** (a) Describe the phenomenon of corona. List out the factors which affect corona loss. **03**
- (b) Write short note on radio interference due to corona. **04**
- (c) What is arcing ground? Explain its effect on the performance of a power system. **07**
- OR**
- Q.5** (a) Define disruptive critical voltage and visual critical voltage. On what factor do they depend? Write equations to calculate these voltages. **03**
- (b) What is meant by electromagnetic interference between power and communication lines? What is its effect? **04**
- (c) Derive an expression for the restriking voltage across the circuit breaker contacts. The system consists of an unloaded alternator with neutral solidly grounded. **07**
