



MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EE 601/PC-EEE 601 Power System-II

UPID : 006603

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

Group-A (Very Short Answer Type Question)

1. Answer any ten of the following :

[1 x 10 = 10]

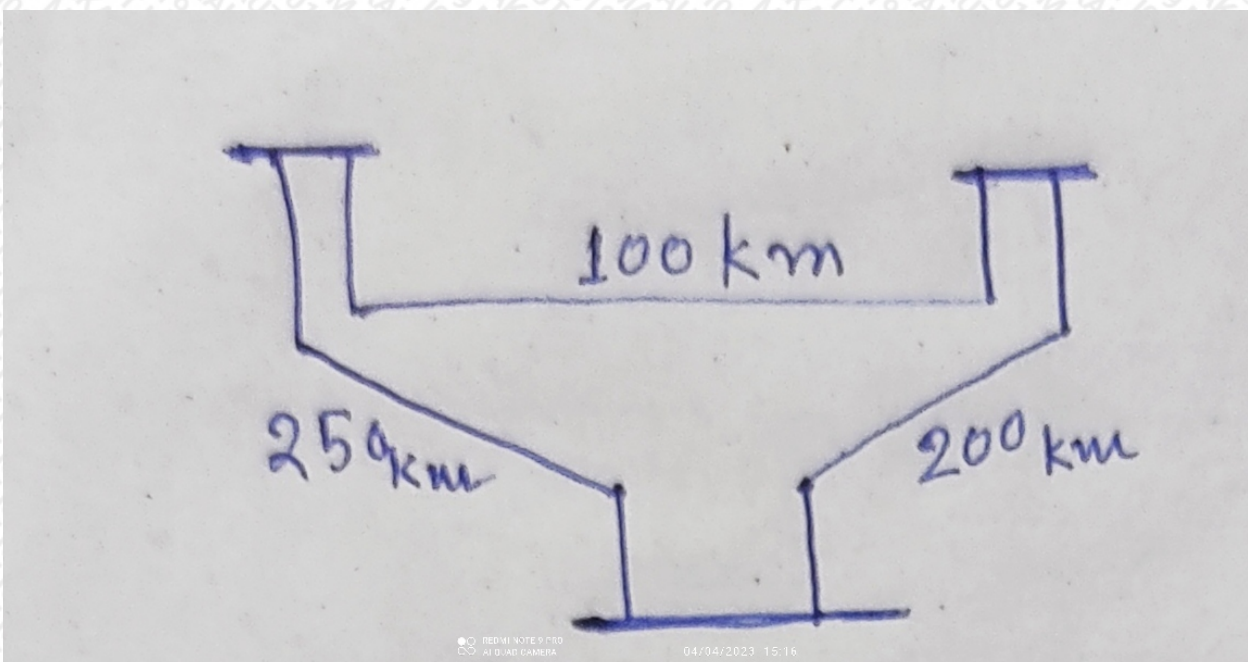
- (I) What will be the per unit value of a 2 ohm resistor at 100 MVA base and 10 Kv base voltage?
- (II) In which type of fault positive sequence component is present?
- (III) What is the unit of inertia constant?
- (IV) The rate of restriking voltage depends upon both _____ and _____. Fill in the blanks
- (V) Why tertiary winding is connected in delta in a three winding transformer?
- (VI) What is the commonly used primary voltage level for distribution system?
- (VII) 'The convergence characteristics of the Newton-Raphson method for solving a load flow problem is quadratic'- Is this statement is True/False ?
- (VIII) $a - a^2 = ?$ 'a' has its usual meaning.
- (IX) What is the maximum torque angle of a synchronous motor?
- (X) If a fault current is 2400 A, the relay setting 150% and CT ratio is 400/5, what is the value of PSM ?
- (XI) The p.u impedance value of an alternator corresponding to base values 13.2 Kv, 30 MVA is 0.2 p.u. What will be p.u value for the base values 13.8 Kv and 50 MVA ?
- (XII) At which end of a transmission line, Power factor correction sub-stations are generally located ?

Group-B (Short Answer Type Question)

Answer any three of the following :

[5 x 3 = 15]

2. Explain the principle of operation of a Buchholz Relay [5]
 3. Define per unit system. What are the advantages of per unit values? [5]
 4. Write a short note on underground substation [5]
 5. What is 'accelerating factor' ? Why it is used in load flow studies? [5]
 6. For the following single line diagram of a network, determine the Y_{bus} matrix: [5]
- Given :
line series reactance is 0.001 p.u/km, shunt susceptance is 0.0016 p.u/km.



Group-C (Long Answer Type Question)

Answer any three of the following :

[15 x 3 = 45]

7. Draw the positive, negative and zero sequence networks for a three phase unloaded synchronous generator with grounded neutral through impedance Z_n and explain it. [15]
8. (a) a) A 50 MVA, 11kV three phase alternator was subjected to different types of faults. The fault currents are as under: [10]
3 phase fault = 2000 A, line- to- line fault = 2600 A, line- to- ground fault = 4200 A.
The alternator neutral is solidly grounded. Find the values of the three sequence reactance of the alternator. Ignore resistances.
- (b) b) A three phase, 3 wire system has normal voltage of 10.4 kV between the lines. It is supplied by a generator having positive, negative and zero sequence reactance of 0.6, 0.5 and 0.2 ohm per phase respectively. Calculate the fault current which flows when a line- to- line fault occurs at the generator terminals. [5]
9. (a) (a) What are the advantages and disadvantages of Gauss-Seidel method and Newton Raphson method? [5]
- (b) (b) Distinguish between voltage control bus and swing bus. What is Jacobian Matrix? [6]
- (c) (c) Why slack bus is necessary in power system? [4]
10. (a) a) A star- connected 3 phase 10 MVA, 6.6 kV alternator has a per phase reactance of 10%. It is protected by Merz-Price circulating current principle which is set to operate for fault currents not less than 175A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected. [8]
- (b) b) A three phase transformer of 220/11,000 line volts is connected in star/delta. The protective transformers on 220 V side have a current ratio of 600/5. What should be the CT ratio on 11,000 V side? [7]
11. (a) a) Explain the following terms for circuit breaker: [6]
(i) Breaking Capacity
(ii) Making Capacity
(iii) Short-time rating
- (b) b) A 50 Hz, 11 kV, 3 phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a bus-bar through a circuit breaker. The distributed capacitance upto circuit breaker between phase and neutral is $0.01 \mu F$. Determine [6]
(i) peak re-striking voltage across the contacts of the breaker
(ii) frequency of oscillations
(iii) the average rate of rise of re-striking voltage upto the first peak
- (c) c) An air-blast circuit breaker is designed to interrupt a transformer magnetising current of 11 kV (r.m.s) chops the current at an instantaneous value of 7A. If the values of L and C in the circuit are 35.2 H and $0.0023 \mu F$. Find the value of voltage that appears across the contacts of the breaker. Assume that all the inductive energy is transferred to the capacitance. [3]

*** END OF PAPER ***