



**B.E DEGREE EXAMINATIONS: NOV 2015**

(Regulation 2009)

Seventh Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

EEE118: Power System Analysis And Stability

**Time: Three Hours**

**Maximum Marks: 100**

**Answer all the Questions**

**PART A (10 x 1 = 10 Marks)**

1. Which one of the following assumption is correct to draw the impedance diagram?
  - a) Neutral grounding impedances are considered
  - b) Loads are represented by inductance only
  - c) Shunt capacitors are neglected
  - d) Loads are represented by resistance only
2. A 1000kVA transformer with 5% reactance will have a reactance of 10% at
  - a) 1000kVA base
  - b) 500kVA base
  - c) 2000kVA base
  - d) 4000kVA base
3. The off-diagonal elements in Y-bus are called as \_\_\_\_\_ .
  - a) self admittance
  - b) mutual admittance
  - c) symmetrical
  - d) unsymmetrical
4. In slack bus \_\_\_\_\_ are specified.
  - a) voltage and phase angle
  - b) real and reactive power
  - c) voltage and reactive power
  - d) phase angle and real power
5. The fault is called \_\_\_\_\_ fault if the fault currents are equal in all the phases.
  - a) unbalanced
  - b) balanced
  - c) unsymmetrical
  - d) symmetrical
6. The \_\_\_\_\_ and \_\_\_\_\_ sequence networks of generator will not have any source.
  - a) positive, negative
  - b) positive , zero
  - c) negative , positive
  - d) negative , zero
7. The material used in surge arresters used in HV power system is
  - a) Graphite
  - b) aluminium oxide
  - c) zinc oxide
  - d) silicon carbide.

8. The equivalent circuit of a surge arrester may be represented as
  - a) A Capacitor
  - b) An inductor
  - c) A non-linear resistor
  - d) A resistor.
9. Equal area criterion assumes
  - a) Negligible damping effect
  - b) Over damping effect
  - c) Considerable damping effect
  - d) Critical damping effect
10. A two-machine system is quite likely to be stable if it survives the \_\_\_\_\_ swing.
  - a) Second
  - b) Third
  - c) First
  - d) Fourth

**PART B (10 x 2 = 20 Marks)**

11. What are the approximations made in constructing impedance diagram?
12. If the reactance is  $15\Omega$ , find the 'per unit value' on a base of 15kVA and 10 kV.
13. Compare gauss seidal and newton raphson method of load flow analysis.
14. Iterative methods are preferred for load flow solution. Why?
15. Define negative sequence impedance.
16. What is the need for Fault analysis?
17. How does travelling waves help to locate fault?
18. List the use of travelling waves in power engineering.
19. For the swing equation  $M \frac{d^2\delta}{dt^2} = P_a$ , what will be the value of  $P_a$  during steady state operation?
20. List the methods of improving the transient stability limit of a power system.

**PART C (5 x 14 = 70 Marks)**

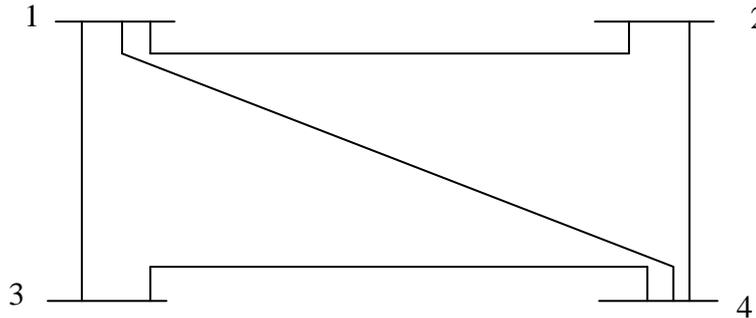
21. a) (i) Explain the different types of studies conducted in power system on the analysis of interest. (7)
- (ii) Write the advantages of per unit system. (7)

**(OR)**

- b) A 100 MVA, 33 kV, 3 phase generator has a subtransient reactance of 15%. The generator has a sub transient reactance of 15%. The generator is connected to the motors through a 50 ohms transmission line and transformers. The motors have rated input of 30MVA, 20MVA and 50 MVA at 30kV with 20% subtransient reactance. The 3 phase transformers are rated at 110MVA, 32kV/110kV  $\Delta$ -Y with a leakage reactance of 8%. The line has a reactance of 50 ohms. Selecting

the generator rating as the base quantities in the generator circuit. Determine the base quantities in other parts of the system and evaluate the corresponding per unit values.

22. a) In the system shown in figure, generators are connected to all the four buses, while loads are at buses 2 and 3. The specifications of the buses are given in table 1 and line impedances are given in table 2. By taking a flat voltage profile, determine the bus voltages at the end of first Gauss seidal iteration.



Bus	P	Q	V	
1	-	-	1.05 with an angle zero	Slack
2	0.5	-0.2	-	PQ
3	-1	0.5	-	PQ
4	0.3	-0.1	-	PQ

Line	R in p.u	X in p.u
1-2	0.05	0.15
1-3	0.1	0.3
1-4	0.2	0.4
2-4	0.1	0.3
3-4	0.05	0.15

(OR)

- b) i) With the help of a neat flow chart, explain the Newton – Raphson method of load flow solution when the system contains voltage controlled buses in addition to swing bus and load bus. (10)
- ii) Explain bus classification in power flow analysis with details of their known and unknown quantities. (4)

23. a) Derive the expression for fault current in double line to ground fault on an unloaded generator in terms of symmetrical components.

(OR)

- b) A generator of negligible resistance having 1 p.u voltage behind transient reactance is subjected to different types of faults.

Type of fault	Resulting fault current in p.u
3 phase	3.33
L-L	2.23
L-G	3.01

Calculate the per unit value of all three sequence reactances.

24. a) i) Explain typical cases of line terminations. (10)  
ii) Write short notes about travelling waves in transmission lines. (4)

**(OR)**

- b) Explain how travelling waves helps to find fault location in transmission line.

25. a) Derive the swing equation of a synchronous machine swinging against an infinite bus. Clearly state the assumptions in deducing the swing equation.

**(OR)**

- b) State and explain equal area criterion in connection with transient stability analysis. What are the advantages and limitations of this method?

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