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15EE71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Power System Analysis – II

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With usual notations, prove that $V_{bus} = A^T Y A$ using singular transformation. (06 Marks)
 b. For the power system shown in Fig.Q1(b), obtain Y_{bus} using singular transformation. (10 Marks)

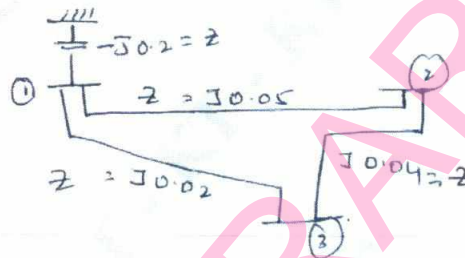


Fig.Q1(b)

OR

- 2 a. What is load flow analysis? Explain how buses are classified to carry out load flow analysis in power system. (06 Marks)
 b. For the sample system of Fig.Q2(b), the generations are connected to all the 4-buses, while loads are at buses 2 and 3. Values of real and reactive powers are listed in Table Q2(b). All buses other than the slack bus are PQ type. (10 Marks)

Bus	P(p.u)	Q(p.u)	W(p.u)	Type of bus
1	-	-	1.040	Ref
2	0.5	-0.2	-	PQ
3	-1.0	0.5	-	PQ
4	0.3	-0.1	-	PQ

Table Q2(b)

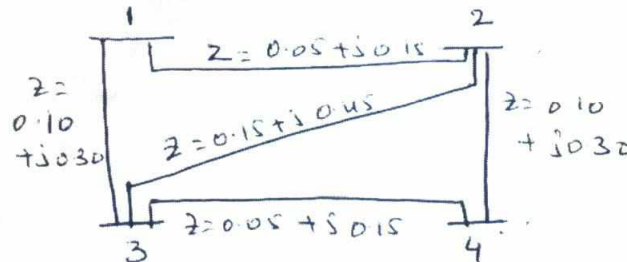


Fig.Q2(b)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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Module-2

- 3 a. Draw the flow-chart of Newton-Raphson method of load flow analysis in polar co-ordinates. (08 Marks)
 b. Derive expression for all elements of Jacobian matrices on polar form. (08 Marks)

OR

- 4 a. Starting all assumptions, deduce the FDLF model and give the flow-chart. (10 Marks)
 b. Compare Gauss-Seidal and Newton-Raphson methods of load flow analysis. (06 Marks)

Module-3

- 5 a. Deduce the condition for optimal load dispatch considering transmission losses in a system. (06 Marks)
 b. The operating cost of C_1 and C_2 in Rs/hr of two generator units each of 100M watt rating of a Thermal plant are,
 $C_1 = 0.2P_1^2 + 40P_1 + 120$ Rs/hr
 $C_2 = 0.25P_2^2 + 30P_2 + 150$ Rs/hr.
 i) Find optimal generation of 2-units for a total demand of 180MW and the corresponding total cost.
 ii) Saving in Rs/hr in this case, as compare to equal sharing between the two machines. (10 Marks)

OR

- 6 a. With a usual notation, derive the generalized transmission loss formula and B-coefficients. (08 Marks)
 b. Calculate the loss co-efficient in p.u and MW^{-1} on a base of SOMUA for the network of Fig.Q6(b) below.

$$I_a = 1.2 - j0.4 ; \quad I_b = 0.4 - j0.2 ; \quad I_c = 0.8 - j0.1 ;$$

$$I_d = 0.8 - j0.2 ; \quad I_e = 1.2 - j0.3$$

$$Z_a = 0.03 + j0.08 ; \quad Z_b = 0.08 + j0.32 ; \quad Z_c = 0.02 + j0.08 ;$$

$$Z_d = 0.03 + j0.12 ; \quad Z_e = 0.03 + j0.12,$$

$$V_{ref} = 1 \angle 0.$$

(08 Marks)

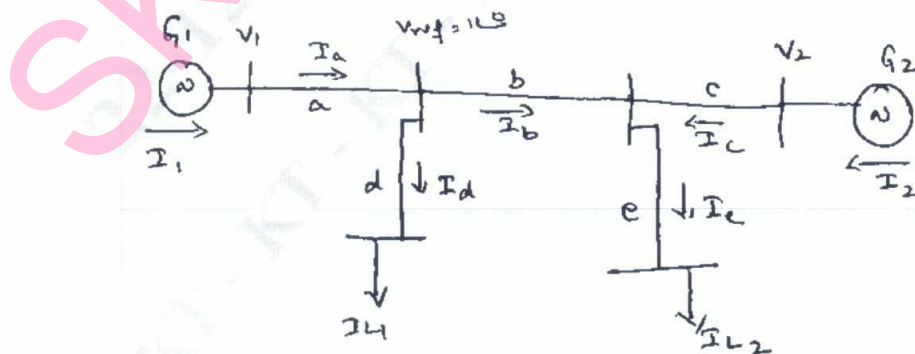


Fig.Q6(b)

Module-4

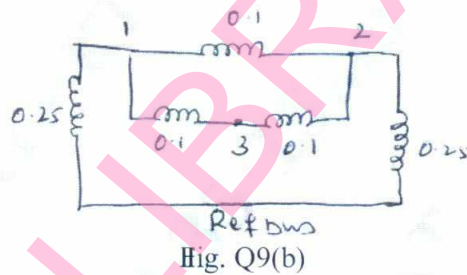
- 7 a. Discuss the problem formulation and solution procedure of optimal scheduling for hydro thermal plant. (10 Marks)
- b. Draw the flow chart of optimal load flow solution. (06 Marks)

OR

- 8 a. Explain power system static security level classification. (08 Marks)
- b. Define : (08 Marks)
- power system reliability
 - power system security.

Module-5

- 9 a. Derive the generalized algorithm for finding the elements of bus – impedance matrix Z_{bus} when a branch is added to the partial network. (08 Marks)
- b. For the three-bus network shown in Fig.Q9(b) build Z_{bus} . (08 Marks)

**OR**

- 10 a. Explain the numerical solution of swing equation. (08 Marks)
- b. Explain clearly the steps involved in solving power system stability solution of swing equation using Runge-Kutta method. (08 Marks)

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15EE72

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

Power System Protection

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. With a neat diagram, explain zones of protection in a power system. (06 Marks)
b. List the merits and Demerits of static Relays. (05 Marks)
c. Explain various methods of back-up protection. (05 Marks)

OR

- 2 a. Briefly explain the essential qualities of a protective relay. (06 Marks)
b. How protective relays are classified list them. (04 Marks)
c. Draw the schematic diagram of Numerical relay and briefly describe the functions of its various components. (06 Marks)

Module-2

- 3 a. With a neat sketch, explain Directional over current relay. (08 Marks)
b. Explain with a neat sketch the basic operation of a impedance Relay. (08 Marks)

OR

- 4 a. With a neat circuit diagram, explain Directional Earth fault Relay. (08 Marks)
b. With a neat schematic diagram, explain the construction and working and Reactance Relay. (08 Marks)

Module-3

- 5 a. Explain the term 'pilot' with reference to power line protection. What are the different types of pilots? Discuss their field of applications. (08 Marks)
b. Describe the balanced (opposed) voltage differential protection scheme. (08 Marks)

OR

- 6 a. A generator is protected by restricted earth fault protection. The generator ratings are 13.2kV, 10MVA. The percentage of winding protected against phase to ground fault is 85%. The relay setting is such that it trips for 20% out of balance. Calculate the resistance to be added in the neutral to ground connection. (08 Marks)
b. With a neat diagram, explain the working of a Buchholz's relay. (08 Marks)

Module-4

- 7 a. Explain how interruption of capacitive current takes place in AC circuit Breaker. (08 Marks)
b. With a neat sketch, explain the construction and working of Non-Puffer type of SF6 circuit Breaker. (08 Marks)

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OR

- 8 a. A 50Hz generator has e.m.f to neutral 7.5kV(rms). The reactance of generator and the connected system is 4Ω and distributed capacitance to neutral is $0.01\mu\text{F}$ with resistance negligible find :
- Maximum voltage across the circuit Breaker contacts
 - Frequency of oscillations
 - Maximum time to reach maximum voltage
 - Average RRRV
- (08 Marks)
- b. With the help of schematic diagram, explain the working of short circuit test plant. (08 Marks)

Module-5

- 9 a. With the help of neat circuit diagram. Explain the construction and working of HRC fuse. (06 Marks)
- b. What are causes of over voltages in a power system. (06 Marks)
- c. Discuss the advantages and disadvantages of Gas Insulated Substations (GIS) as compared to conventional Air Insulation Substations (AIS). (04 Marks)

OR

- 10 a. Define the following :
- Fusing factor
 - Fuse
 - Fusing current.
- (06 Marks)
- b. With a neat sketch, explain the working of Klydonograph. (05 Marks)
- c. What are the various components of a GIS? Briefly describe their functions. (05 Marks)

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15EE73

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 High Voltage Engineering

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Explain the current growth in the presence of secondary processes. (08 Marks)
b. Classify the breakdown mechanism in liquids and explain any one mechanism. (08 Marks)

OR

- 2 a. Classify the breakdown mechanism in solids and explain any one mechanism. (10 Marks)
b. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8} A at a distance of 0.4cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1cm result in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α . (06 Marks)

Module-2

- 3 a. What are the different forms of high voltage and mention their applications. (06 Marks)
b. Explain with schematic diagram the Marx circuit of multistage impulse generator incorporating the series and wave tail resistances within the generator. (10 Marks)

OR

- 4 a. With a neat sketch, explain Cockcroft Walton voltage multiplier circuit and also draw the voltage waveforms across the first and last capacitors of the cascaded voltage multiplier circuit. (10 Marks)
b. How a full impulse wave is characterized? Explain. (06 Marks)

Module-3

- 5 a. What are the factors influencing the spark over voltage of spheregaps? Explain any two factors. (08 Marks)
b. Determine the breakdown voltage for air gaps 2mm and 15mm lengths under uniform field and standard atmospheric conditions. Also determine the voltage is the atmospheric pressure is 750mm Hg and temperature 35°C (08 Marks)

OR

- 6 a. Draw Chubb – Hortescue circuit for measurement of peak value of a.c voltages. Discuss its advantages over other methods. (08 Marks)
b. What is Rogowski coil? Explain with a neat diagram its principle of operation for measurement of high impulse currents. (08 Marks)

Module-4

- 7 a. Explain the different theories of charge formation in the clouds. (08 Marks)
b. What are the different methods employed for lighting protection of over head lines? Explain them. (08 Marks)

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OR

- 8 a. A 3-phase single circuit transmission line is 400km long. If the line is rated for 220kV and has parameters, $R = 0.1\Omega/\text{km}$, $L = 1.26\text{mH}/\text{km}$, $C = 0.009, \mu\text{F}/\text{km}$ and $G = 0$. Find (i) The surge impedance and (ii) The velocity of propagation neglecting the resistance of the line if a surge of 150kV and infinitely long tail strikes at one end of the line, what is the time taken for the surge to travel to the other end of the line? (08 Marks)
- b. Write a note on surge diverters. (08 Marks)

Module-5

- 9 a. With a neat circuit diagram, explain the balanced detection method using Schering bridge. (08 Marks)
- b. Explain the operation of Schering bridge for three terminal measurements with Wagner's earthing device. (08 Marks)

OR

- 10 a. A 33 kV, 50Hz, high voltage Schering bridge is used to test a sample of insulation. The various arms have the following parameters on balance. The standard capacitance 500pF, the resistive branch 500 ohms and branch with parallel combination R and C, has 180Ω and $0.15\mu\text{F}$. Determine the value of capacitance of this sample, its parallel equivalent loss resistance, The pF and power loss under these conditions. (08 Marks)
- b. Explain the methods to determine the large capacitance using shunt arrangement. (08 Marks)

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15EE744

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019

Power System Planning

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. What do you mean by planning process? Mention the step-by-step procedure to planning action with block diagram. (08 Marks)
b. With structural model explain different organizations in power system. (08 Marks)

OR

- 2 a. With the aid of schematic diagram, explain various strategies of load management. (08 Marks)
b. Explain different demand forecasting techniques used in power system planning. (08 Marks)

Module-2

- 3 a. With block diagram explain private participation with respect to ownership options and modes of participation in power system planning. (08 Marks)
b. Mention national tariff policies and explain two types of basic tariffs. (08 Marks)

OR

- 4 a. What is generation mix? Explain the importance of pumped storage system. (08 Marks)
b. Explain clean coal technologies used in coal based plants. (08 Marks)

Module-3

- 5 a. Explain the criteria for transmission planning in power system. (08 Marks)
b. What is distributed power generation and explain with figure biomass gasification. (08 Marks)

OR

- 6 a. What are the reasons and advantages favouring HVDC transmission lines? (08 Marks)
b. Mention and explain different conductors used in transmission system. (08 Marks)

Module-4

- 7 a. What are the different basic distribution systems used by utilities and explain radial and loop systems with figure. (08 Marks)
b. What are the national rural electrification policies and main components of rural electrification? (08 Marks)

OR

- 8 a. Explain criteria for generation reliability. (08 Marks)
b. With flow diagram explain total system reliability cost analysis. (08 Marks)

Module-5

- 9 a. With block diagram, explain energy-efficiency programmes. (08 Marks)
b. What is demand response? Explain demand-response planning with block diagram. (08 Marks)

OR

- 10 a. What are the principles for the electricity market? (10 Marks)
b. Name different types of power markets. (06 Marks)

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15EE752

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019 Testing and Commissioning of Power System Apparatus

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing one full question from each module.

Module-1

- 1 a. Explain the principle of on load tap changer. (08 Marks)
b. Explain the meaning of insulation resistance. How is it measured for power transformer? (08 Marks)

OR

- 2 a. Explain the procedure of drying out of power transformer. (08 Marks)
b. Explain the standard vector groups of 3-phase transformer connections for 0° displacement and $+30^\circ$ displacement. Give the summary of common 3 phase's connections. (08 Marks)

Module-2

- 3 a. Explain the procedure of foundation of electric machine. (08 Marks)
b. Explain the principle of brushless excitation system. (08 Marks)

OR

- 4 a. Explain the sudden three phase short circuit test on a 3 phase generator. Explain how to calculate x'_d , x''_d and x_d from sudden 3ph.S.C.test. (10 Marks)
b. State the routine tests required for a synchronous generator. (06 Marks)

Module-3

- 5 a. State the various abnormal conditions in Induction motors and which are the protections provided against each. (10 Marks)
b. Explain the term efficiency of an Induction motor. How can it be calculate from the data obtained from the no load test and locked rotor test. (06 Marks)

OR

- 6 a. Explain the various methods of measuring the slip of an Induction motor. (08 Marks)
b. State the various steps in installation of a large rotating machine received in dismantled condition. (08 Marks)

Module-4

- 7 a. State the factors to be considered while selecting a cable. (08 Marks)
b. Explain the various aspects to be considered in laying underground cables. (08 Marks)

OR

- 8 a. Describe the steps to be taken after occurrence of fault in underground high voltage cable. (06 Marks)
b. Explain the radar method of locating cable fault. (10 Marks)

Module-5

- 9 a. State the various type tests and routine tests performed on High voltage a.c. circuit breakers. (08 Marks)
b. Explain protective Devices in residential electrical installation. (08 Marks)

OR

- 10 a. State the various steps in installation and commissioning of outdoor circuit breaker. (08 Marks)
b. Describe typical low voltage, 3 phase, 4 wire and single phase AC supply system for residential building. (08 Marks)

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