CBCS SCHEME

USN | | | | | | | | | | |

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 $Y_{bus} = A^T Y A$ using singular transformation. **(06 Marks)**

b. For the power system shown in Fig.Q1(b), obtain Y_{bus} using singular transformation. **(10 Marks)**

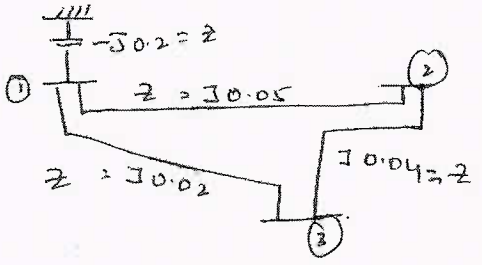

Fig.Q1(b)

OR

2 a. What is load flow analysis? Explain how buses are classified to carly 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	$P(p_u)$	$Q(p_u)$	$V(p_u)$	Type of bus
1	–	–	$1.04\underline{0}$	Ref
2	0.5	– 0.2	–	PQ
3	– 1.0	0.5	–	PQ
4	0.3	– 0.1	–	PQ

Table Q2(b)

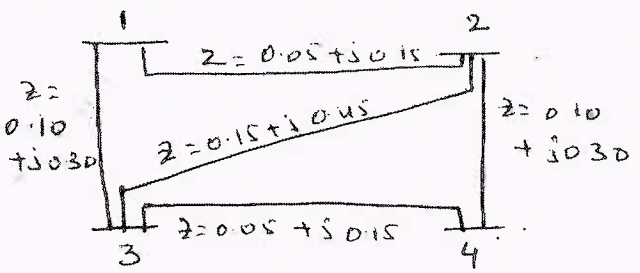

Fig.Q2(b)

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 Jacobbian 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 disipatch 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.

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

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

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

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

$V_{ref} = 1 \angle 0$. **(08 Marks)**

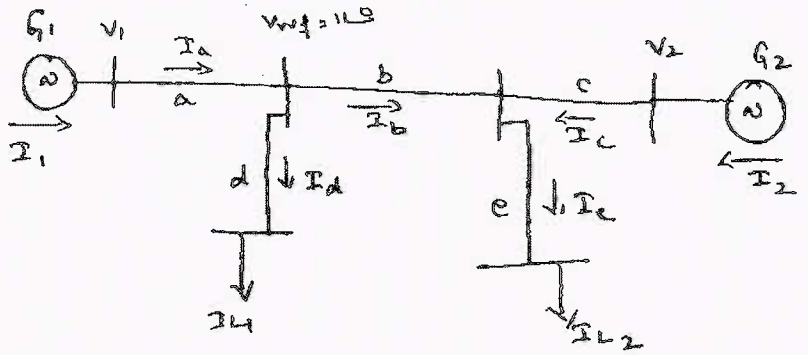

Fig.Q6(b)

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 :

i) power system reliability

ii) power system security. **(08 Marks)**

Module-5

9 a. Derive the generalized algorithm for finding the elements of bus – impedance matrix Z_{bus} when a branch in added to the partial network. **(08 Marks)**

b. For the three-bus network shown in Fig.Q9(b) build Z_{bus}. **(08 Marks)**

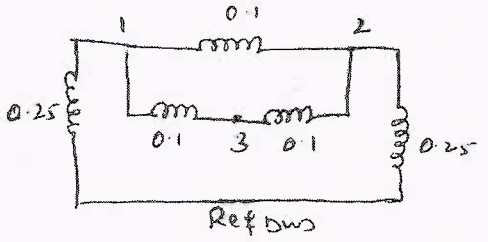

Fig. Q9(b)

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 Range-Kutta method. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

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 is 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)**

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 0.01μF with resistance negligible find :
   i) Maximum voltage across the circuit Breaker contacts
   ii) Frequency of oscillations
   iii) Maximum time to reach maximum voltage
   iv) 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 :
   i) Fusing factor
   ii) Fuse
   iii) 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)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

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 – Fortescue 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)**

OR

8 a. A 3-phse single circuit transmission line is 400km long. If the line is rated for 220kV and has parameters, R = 0.1Ω/km, L = 1.26mH/km, C = 0.009, μF/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 earthling 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 0.15μF. 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)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE742

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Utilization of Electrical Power

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Discuss the AJAX WYATT furnace with neat diagram. **(05 Marks)**

b. Discuss the principle of dielectric heating and obtain expression for dielectric power loss. **(05 Marks)**

c. A 15 kW, 220 V, single phase resistance oven employes nickel-chrome wire for its heating elements. If the wire temperature is not to exceed 1000°C and the temperature of the charge is to be 600°C, calculate the diameter and length of the wire. Assume radiating efficiency to be 0.6 and emissivity as 0.9. For nickel chrome resistivity is 1.016×10^{-6} Ω-m. **(06 Marks)**

OR

2 a. State and explain Faraday's law of electrolysis. **(05 Marks)**

b. What is electro-deposition? Discuss factors which affect quality of electro deposition. **(05 Marks)**

c. A 20 cm long portion of a circular shaft having 10 cm diameter is to be coated with a layer of 1.5 mm nickel. Determine the quantity of electricity in Ah and the time taken for the process. Assume a current density of 195 A/m^2 and a current efficiency of 92%. Specific gravity of nickel is 8.9 gm/cm^3 and its ECE is 1.0954 kg per 1000 Ah. **(06 Marks)**

Module-2

3 a. Discuss the laws of illumination. **(05 Marks)**

b. Define the following terms and their units:
(i) Luminous flux (ii) Luminous intensity (iii) Illumination
(iv) Mean horizontal candle power (v) Mean spherical candle power **(05 Marks)**

c. Two lamp posts are 16 m apart and are fitted with a 100 CP lamp each at a height of 6 m above ground. Calculate the illumination on the ground. (i) Under each lamp (ii) Midway between the lamps. **(06 Marks)**

OR

4 a. Explain the working of sodium vapour lamp with neat circuit diagram. **(05 Marks)**

b. Explain requirement of good lighting system. **(05 Marks)**

c. Discuss the measurement of mean spherical candle power by integrating sphere with neat diagram. **(06 Marks)**

Module-3

5 a. Using a trapezoidal speed time curve, derive an expression for its maximum speed. **(05 Marks)**

b. Discuss the factors affecting specific energy consumption. **(05 Marks)**

c. A train is required to run between two stations 1.6 km apart at an average speed of 40 kmph. The run is to be made to a simplified quadrilateral speed-time curve. If the maximum speed is to be limited to 64 kmph, acceleration to 2.0 kmphps and coasting and braking retardation to 0.16 kmphps and 3.2 kmphps respectively, determine the duration of acceleration, coasting and braking periods. **(06 Marks)**

OR

6 a. With relevant graph, explain traction motor characteristics. **(05 Marks)**

b. Explain series parallel control of dc motors. **(05 Marks)**

c. The supply fed to the series connection is 650 V. If the first motor is geared to driving wheels of radius 45 cms and other to 43 cms and if speed of first motor when connected in parallel to second motor across the main supply lines is 400 rpm. determine speeds of motors when connected in series. Assume armature current to remain same and armature voltage drop of 10% at this current. **(06 Marks)**

Module-4

7 a. Explain (i) Plugging (ii) Rheostatic braking (iii) Regenerative braking as applied to dc motor. **(08 Marks)**

b. A train weighing 400 tonnes has speed reduced by regenerative braking from 40 to 20 kmph over a distance of 2 km along down gradient of 2%. Calculate the electrical energy and average power returned to the line. Tractive resistance is 40 N/tonne and allow rotational inertia of 10% and efficiency of conversion 75%. **(08 Marks)**

OR

8 a. Write a note on : (i) The Tramway and (ii) Trolley bus. **(08 Marks)**

b. Explain the function of a negative booster in a framway system. **(08 Marks)**

Module-5

9 a. Explain configurations of Electric vehicles with neat diagram. **(08 Marks)**

b. Discuss the energy consumption in electric vehicles. **(08 Marks)**

OR

10 a. Discuss the hybrid electric vehicle-working principle, with relevant block diagram. **(08 Marks)**

b. Write a note on:

(i) Series hybrid drive trains.

(ii) Parallel hybrid drive trains. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

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° displacement. Give the summery 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)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE71

Seventh Semester B.E. Degree Examination, June/July 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 the help of suitable examples, explain (i) Oriented graph (ii) Tree (iii) Cotree **(05 Marks)**

b. With usual notations, show that $Y_{bus} = A^t yA$ using singular transformation. **(05 Marks)**

c. An oriented graph of a 4-bus power system is shown in Fig.Q1(c). Determine the bus admittance matrix, Y_{bus} using singular transformation method. Element numbers and self-impedance of the elements are marked on the diagram in pu. Neglect mutual coupling.

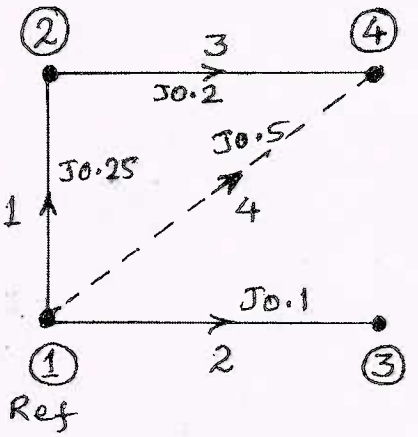

Fig.Q1(c) **(06 Marks)**

OR

2 a. What is load flow analysis? Explain the different types of buses considered during power system load flow. Discuss the significance of slack bus in load flow studies. **(06 Marks)**

b. Define primitive network. Give the representation of a typical component and arrive at their performance equations in impedance and admittance forms. **(04 Marks)**

c. One line diagram of a power system is shown in Fig.Q2(c). Using Gauss-Seidel method, determine the complex voltage at Bus-2 at the end of first iteration. Given that $V_1 = 1\angle 0$ pu, $P_2 + JQ_2 = -5.96 + J1.46$ pu, $|V_3| = 1.02$ pu, $Z_{12} = 0.04 + J0.06$ pu and $Z_{23} = 0.02 + J0.03$ pu.

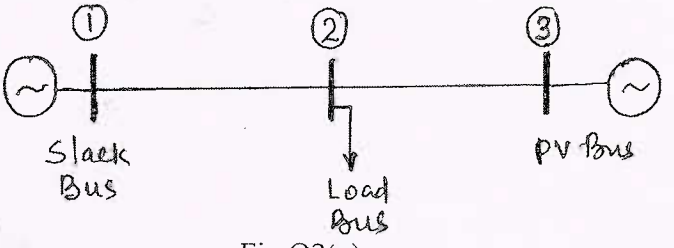

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. Differentiate between NR and GS methods of load flow analysis in respect of the following:
   i) Time per iteration
   ii) Total solution time
   iii) Acceleration of convergence of iterative solution
   iv) Adoptability for power system calculations **(04 Marks)**

b. Discuss how the voltage profile is controlled in an interconnected power system by
   i) Adjusting generator excitation
   ii) VAR generators **(06 Marks)**

c. Explain the significance and properties of Jacobian matrix of Newton-Raphson load flow analysis. **(06 Marks)**

OR

4 a. Deduce FDLF model clearly stating all the assumptions made. **(08 Marks)**

b. With the help of a flow chart, explain the Newton-Raphson method of load flow analysis. **(08 Marks)**

Module-3

5 a. Derive an expression for optimal operation of 'n' units within a plant considering the effect of transmission losses. **(06 Marks)**

b. What are B-coefficients? For the system shown in Fig.Q5(b), obtain loss coefficients and the power loss. Take $I_1 = 1\angle 0$ pu. $I_2 = 0.8\angle 0$ pu, $V_3 = 1\angle 0$ pu. Transmission lines impedances, $Z_a = 0.02 + J0.25$ pu and $Z_b = 0.03 + J0.35$ pu.

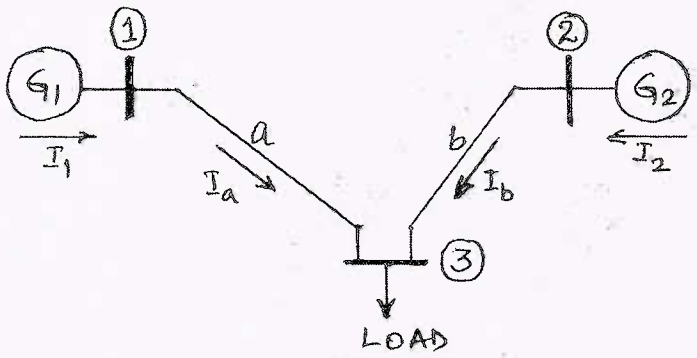

Fig.Q5(b) **(10 Marks)**

OR

6 a. State unit commitment problem. Describe the dynamic programming method for computation of optimal unit commitment. **(07 Marks)**

b. The incremental fuel costs in Rs/MWh for a plant consisting of two units are:

$$\frac{dc_1}{dP_{g_1}} = 0.25\,P_{g_1} + 40 \qquad \frac{dc_2}{dP_{g_2}} = 0.3\,P_{g_2} + 30$$

Assume that both units are operating at all times and the total load varies from 40 MW to 250 MW.
   i) How will the load be shared for a load of 200 MW? What is the corresponding value of plant incremental cost?
   ii) Determine the saving in the fuel cost in Rs./day for the optimal scheduling of a total load of 250 MW as compared to equal distribution of the same load between the two units. **(09 Marks)**

Module-4

7 a. Discuss clearly the problem formulation and solution procedure of optimal scheduling for hydro-thermal plants. **(08 Marks)**

b. What do you understand by the reliability of a power system? Explain the state space model used for power system reliability evaluation. **(08 Marks)**

OR

8 a. Describe the power system security assessment and modeling for contingency analysis. **(08 Marks)**

b. Explain with the help of a flow chart, the optimal load flow solution. **(08 Marks)**

Module-5

9 a. Derive the generalized expression for finding the diagonal element of bus impedance matrix when a branch is added to the partial network. **(08 Marks)**

b. Discuss the steps for determining multimachine stability. **(08 Marks)**

OR

10 a. With the necessary equations, explain the solution of swing equation by point by point method. Mention the assumptions made. **(08 Marks)**

b. Form Z_{bus} using building algorithm of the power system shown in Fig.Q10(b). Self impedance of elements are marked on the diagram. Add elements in the order specified. Neglect mutual coupling. Take bus-1 as reference bus.

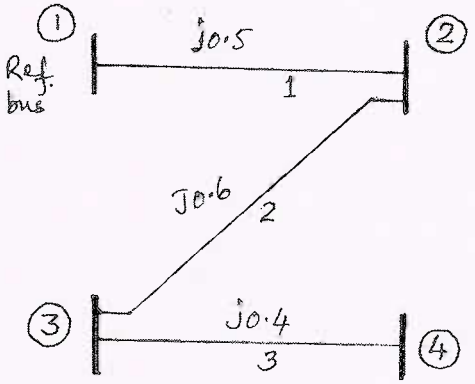

Fig.Q10(b) **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE81

Eighth Semester B.E. Degree Examination, June/July 2019
Power System Operation and Control

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 operating states of power system, with a neat diagram showing the transition between the states. **(08 Marks)**

b. Explain the algorithm of priority list method of unit commitment. **(08 Marks)**

OR

2 a. With a neat diagram explain the general configuration and major components of SCADA system. **(08 Marks)**

b. Explain the various constraints to be considered in unit commitment. **(08 Marks)**

Module-2

3 a. With mathematical model and constraint, explain r-λ iterative algorithm for short term hydrothermal scheduling. **(10 Marks)**

b. Two synchronous generators operate in parallel to supply a load of 400 MW. The capacities of the machines are 200 MW and 500 MW. Each has a droop characteristics of 4%. Their governors are adjusted so that the frequency is 100% on full load. Calculate the load supplied by each unit and frequency at this load. The system is 50 Hz system. **(06 Marks)**

OR

4 a. A two plant system with a hydral plant and a thermal plant has the following characteristics. The fuel cost characteristic of thermal plant is $F_T = 20P_{GT} + 0.04P_{GT}^2 Rs/hr$. The water discharge characteristics of hydral plant is $Q = 7.5P_{GH} + 0.004P_{GH}^2 m^3/sec$. The constant which converts incremental water discharge to incremental plant cost γ is 4.1×10^{-4} Rs/m^3 and $\lambda = 70$ Rs/MWhr, $B_{GH} = 0.0025$ MW^{-1}. Determine the generation of each plant, the load on the system and losses. **(08 Marks)**

b. Explain the following terms used in AGC:
i) Control area ii) Tie line
iii) Net interchange iv) Station control error **(08 Marks)**

Module-3

5 a. Derive the generator model, load model and combined generator load model of ALFC system. **(07 Marks)**

b. Two control areas are connected via a tie line with the following characteristics:
Area 1 : R1 = 1%, $D_1 = 0.8$, base MVA : 500
Area 2 : R1 = 2%, D = 1.0, base MVA : 500
A load change of 100 MW occurs in Area 1. Find the new steady state frequency, change in the line flow and change in generation of each area if the nominal frequency is 50 Hz. **(09 Marks)**

OR

6 a. A single area consists of two generators with following data:
G1: 200 MW $R_1 = 4\%$ (on machine base)
G2 : 400 MW $R_1 = 5\%$ (on machine base)
They are connected in parallel and share a load of 600 MW in proportion to their ratings, at 50 Hz. If 200 MW of load is tripped, what is the generation by each unit? What is the frequency at new load is D = 1.5 pu (on a base of 200 MW). Choose a base of 200 MW. Also find the increase in load due to frequency. **(08 Marks)**

b. Derive the state model of an isolated AGC system. **(08 Marks)**

Module-4

7 a. Explain the different methods of voltage control by reactive power injection. **(08 Marks)**

b. Three generating stations are connected to a common bus bar and as shown in Fig.Q7(b). For a particular system load the line voltage at bus x falls by 5 KV. Calculate the reactive power injection required to bring back the voltage to the original value. All pu values are on a base of 500 MVA.

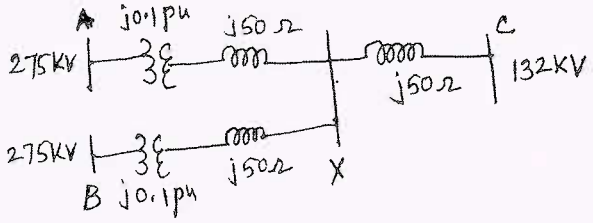

Fig.Q7(b) **(08 Marks)**

OR

8 a. Explain voltage control using; tap changing transformers, Booster transformers and phase shifting transformers. **(08 Marks)**

b. A 415 V, 50 Hz 3ϕ system delivers 500 KW at 0.8 p.f. lag. Shunt capacitors are installed to improve the p.f. to 0.92. Determine the value of capacitors needed if the capacitor bank is star connected. **(08 Marks)**

Module-5

9 a. With a neat flow chart, explain contingency analysis for generation outage using generation shift sensitivity factors. **(08 Marks)**

b. Explain the formulation and state estimate using linear least square estimation. Also explain the condition for observability in least square estimates. **(08 Marks)**

OR

10 a. With a neat flow chart, explain contingency analysis for line outage, using line outage distribution factors. **(08 Marks)**

b. Explain 1P1Q method for contingency Ranking. Also explain contingency processing using AC load flow analysis with a flow chart. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE82

Eighth Semester B.E. Degree Examination, June/July 2019
Industrial Drives and Applications

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Obtain expressions for equivalent load torque and equivalent of a motor drive with i) translational and ii) rotational motion loads. **(08 Marks)**

b. A motor is equipped with a flywheel is to supply a load torque of 1000 N-m for 10 sec followed by a light load period of 200N-m long enough for the flywheel to regain its steady state period. It is desired to limit the motor torque to 700N-m. What should be the moment of inertia of the flywheel? Motor has an inertia of 10kg-m^2. Its no load speed is 500rpm and the slip at a torque of 500 N-m is 50%. Assume speed torque characteristics of motor to be a straight line in the region of interest. **(08 Marks)**

OR

2 a. Explain clearly different components of load torque with its characteristics. Also give a brief description of classification of load torques. **(08 Marks)**

b. A drive has the following parameters:
J = 10 kg-m^2, T = 100 – 0.1N N-m, passive load torque T_l = 0.05N N-m where N is the speed in rpm. Initially the drive is operating in steady-state. Now it is to be reversed. For this motor characteristic is charged to T = -100 – 0.1N N-m. Calculate the time of reversal. **(08 Marks)**

Module-2

3 a. With usual notations derive expression for the temperature rise of a machine. Sketch the temperature rise v/s time curve. **(10 Marks)**

b. A constant speed drive has the following duty cycle:
i) Load rising from 0 to 400kW in 5 min.
ii) Uniform load of 500 kW for 5 min
iii) Regenerative power of 400kW returned to supply for 4 min
iv) Remains idle for 2 min. **(06 Marks)**

OR

4 a. Explain the single phase fully controlled rectifier control of separately excited DC motor. Also obtain equations for average out put voltage V_a and speed W_m. Assume discontinuous conduction mode. **(10 Marks)**

b. A 220V, 1500 rpm, 50A separately excited motor with armature resistance of 0.5Ω is fed from a 3 phase fully controlled rectifier. Available ac source has a line voltage of 440V, 50Hz. Determine the value of firing angle when
i) Motor is running at 1200 rpm and rated torque.
ii) Motor is running at -800 rpm and twice the rated torque. **(06 Marks)**

Module-3

5 a. Explain the behaviour of 3 phase induction motor when fed from a non-sinusoidal voltage supply. **(06 Marks)**

b. A 2200V, 260kW, 735 rpm, 50Hz, 8 pole, 3 phase, squirrel cage induction motor has the following parameters referred to the stator:

$R_s = 0.075\ \Omega$, $R_r' = 0.1\Omega$, $X_s = 0.45\Omega$, $x_r' = 0.55\Omega$. Stator winding is delta connected and consists of two sections connected in parallel.

i) Calculate starting torque and maximum torque as a ratio of rated torque, if the motor is started by star-delta switching. What is the max value of line current during starting?

ii) If the motor is started by connecting series reactors in line, what should be the value of reactors so as to limit the line current to twice the rated value? **(10 Marks)**

OR

6 a. Explain ac dynamic braking of 3 phase induction motor with i) Two lead ii) Three lead connections. **(10 Marks)**

b. Derive expressions for time required stop the induction motor by plugging when running at synchronous speed. **(06 Marks)**

Module-4

7 a. Explain with relevant diagrams the Voltage source Inverter (VSI) control of 3 phase induction motor. What are the disadvantages of this method, how they can be minimized? **(08 Marks)**

b. Explain the closed loop control for VSI controlled 3 phase induction motor. **(08 Marks)**

OR

8 a. Explain the 3 phase induction motor fed from a variable frequency CSI. What are its advantages and disadvantages and remedial measures? **(06 Marks)**

b. A single phase, 220V, 50Hz, 1425 rpm induction motor has the following parameters:

Rs = 2Ω, $R_r' = 5\Omega$, $X_s = X_r' = 6\Omega$ and $X_m = 60\Omega$. It drives a fan load at rated speed when full voltage is applied. Motor speed is controlled by the stator voltage control. Calculate the motor terminal voltage for a speed of 1200 rpm. **(10 Marks)**

Module-5

9 a. Explain self controlled synchronous motor drive employing load commutated thyristor inverter. **(08 Marks)**

b. Explain brushless dc motor drive for servo applications. **(08 Marks)**

OR

10 a. Explain variable reluctance type stepper motor. **(08 Marks)**

b. Explain the drive requirements for i) Steel rolling mill ii) Cranes and hoists. **(08 Marks)**

* * * * *

CBCS SCHEME

USN | | | | | | | | | | |

15EE831

Eighth Semester B.E. Degree Examination, June/July 2019
Smart Grid

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Explain what you understand by "Smart Grid". Compare Today's grid with smart grid. **(08 Marks)**

b. What are the attributes that can be a basis for a definition of smart grid? **(08 Marks)**

OR

2 a. Write short notes on the following terms:
i) WAMS
ii) PMU
iii) Smart meters
iv) Smart appliances. **(08 Marks)**

b. Explain the security type performance indices for ranking the severity of various contingencies. **(08 Marks)**

Module-2

3 a. Explain voltage stability and voltage collapse. **(08 Marks)**

b. What are the different classifications of voltage stability? **(08 Marks)**

OR

4 a. Explain different methods of "Angle stability assessment". **(08 Marks)**

b. Explain the attributes desirable in the development of state estimate for smart grids. **(08 Marks)**

Module-3

5 a. Write a note on computational tools used for smart grid design. What are the important questions that has to be addressed by the computational tools and techniques. **(08 Marks)**

b. What are the computational challenges associated with using advanced tools for Smart Grid control. **(08 Marks)**

OR

6 a. Write a note on general level of automation required for an effective operation of Smart Grid. **(08 Marks)**

b. Explain Bulk power systems automation of smart grid at transmission level. **(08 Marks)**

Module-4

7 a. Describe electric vehicle and plug-in-hybrids. **(08 Marks)**

b. i) Explain fuel cells operation. What are the efficiencies attainable?
ii) Explain the principle of "Geo thermal heat pumps". **(08 Marks)**

OR

8 a. What is interoperability? What is the state of the art in the interoperability in smart grid components? **(08 Marks)**

b. What are the cyber security risks in each phase of project life cycle of smart grids? **(08 Marks)**

Module-5

9 a. What are the technological expertise required by professionals of smart grid operation and control? **(08 Marks)**

b. What are the research areas that can strengthen smart grids? **(08 Marks)**

OR

10 a. Explain with a sketch, a sample microgrid test bed-environment. Which includes renewable energy sources? **(08 Marks)**

b. Explain the following terms:

i) Demand response

ii) Peak and time of use-pricing. **(08 Marks)**

* * * * *