CBCS SCHEME

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15EE71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Define the following with simple examples:
(i) Tree
(ii) Element bus incidence matrix **(04 Marks)**

b. Explain how buses are classified for load flow study. **(06 Marks)**

c. Obtain Y_{bus} by singular transformation method for the system having following data. Take bus 4 as ref bus

Element No.	1	2	3	4	5
Bus code (p-q)	1-2	2-3	3-4	1-4	2-4
Admittance (pu)	2	1.5	3	2.5	4

(06 Marks)

OR

2 a. What is primitive network? Obtain admittance form of primitive network. **(04 Marks)**

b. Explain the method of Y_{bus} by singular transformation. **(06 Marks)**

c. For the system shown in Fig.Q2(c) obtain solution of voltage and angles of bus 2 and 3 at the end of one iteration. Using Gauss-Seidel load flow method. Use flat start. Line data is in impedance form.

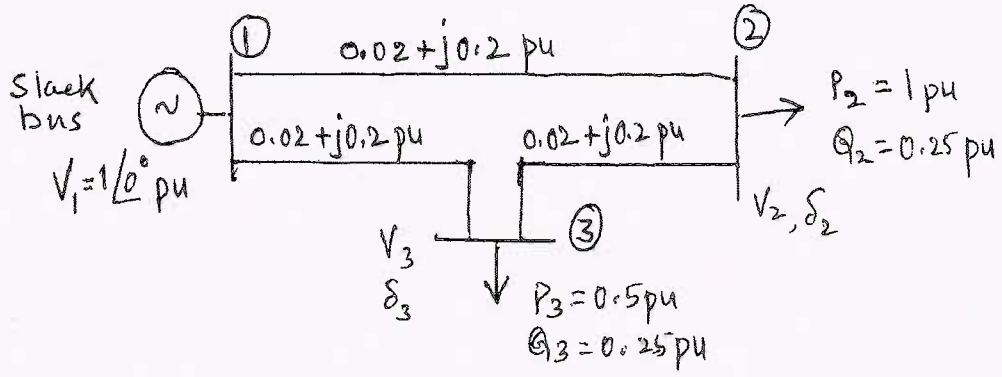

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. What are Jacobian elements? Obtain Jacobian elements for basic equations for J_1 and J_3 only. **(04 Marks)**

b. Give the algorithm for Newton-Raphson (NRLF) load flow. **(06 Marks)**

c. Explain any two methods of control of voltage profile. **(06 Marks)**

OR

4 a. Explain the control of voltage by Tap changing transformer. **(04 Marks)**

b. Draw a flow chart for Fast Decoupled Load Flow (FDLF) method. **(06 Marks)**

c. Compare load flow methods with standard features. **(06 Marks)**

Module-3

5 a. Explain the followings:
(i) Input-output curve
(ii) Heat rate curve
related to thermal plants **(04 Marks)**

b. Define Unit Commitment. Explain Dynamic programming method of Unit Commitment solution. **(06 Marks)**

c. With the help of two state model of generator derive probability of availability and unavailability in terms of failure rate and repair rate. **(06 Marks)**

OR

6 a. The fuel input per hour of plant 1 and plant 2 are given by,

$F_1 = 0.2P_1^2 + 40P_1 + 120$ RS/Hr $\qquad F_2 = 0.25P_2^2 + 30P_2 + 150$ RS/Hr

Determine the economic scheduling neglecting the losses for a load of 180 MW. Also calculate cost of production of 180 MW for the obtained schedule. **(04 Marks)**

b. Obtain transmission line loss coefficients interms of plant generation capacities for two units delivering a load. **(06 Marks)**

c. Obtain economic scheduling for a system having transmission line losses and no limits on generators. **(06 Marks)**

Module-4

7 a. Explain the followings:
(i) Loss of Load Probability (LOLP)
(ii) Frequency and duration of state (FAD) **(04 Marks)**

b. Explain hydro-thermal scheduling in brief with the mathematical formula. **(06 Marks)**

c. With the help of Bath tub curve, explain different failures in a system and initiatives to reduce the failures. **(06 Marks)**

OR

8 a. List and explain advantages of maintenance scheduling. **(04 Marks)**

b. Explain system security states with a block diagram. **(06 Marks)**

c. Explain the followings:
(i) Generation shift distribution factor
(ii) Line outage distribution factor **(06 Marks)**

Module-5

9 a. Explain the Z_{build} algorithm for a link addition to the partial network with no mutual coupling. **(08 Marks)**

b. Explain solution of swing equation by Runge-Kutta order 4 method. **(08 Marks)**

OR

10 a. Obtain Z_{bus} by Z_{build} technique for the system shown in Fig.Q10(a). All values are in pu (impedance). Take bus '0' as reference bus. Add the elements in the order ref bus to bus 1, ref bus to bus 2 and lastly bus 1 to bus 2.

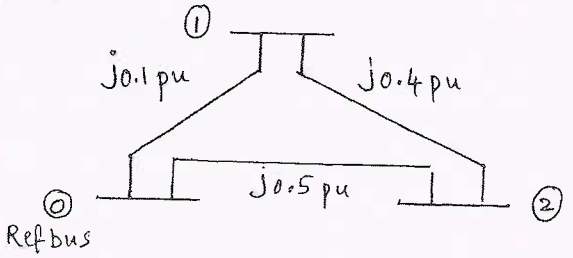

Fig.Q10(a) **(08 Marks)**

b. Explain solution of swing equation by point by point method. **(08 Marks)**

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15EE72

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 schematic diagram, explain various zones of protection of a power system. **(06 Marks)**

b. Explain the importance of automatic reclosing. **(04 Marks)**

c. What are the advantages of static relays over electro mechanical relays? **(06 Marks)**

OR

2 a. The current rating of a relay is 5Amps, PSM = 1.5 CT ratio is 400/5. Fault current = 6000 Amps. Determine the operating time of the relay for a TMS = 0.4. The operating time at various PSM at TMS = 1 are given in the below table. **(06 Marks)**

PSM	2	4	5	8	10	20
Operating time in seconds	10	5	4	3	2.8	2.4

b. Draw the schematic diagram of numerical relay and explain the functions of various components. **(06 Marks)**

c. With neat sketch, explain the working principle of reed relay. **(04 Marks)**

Module-2

3 a. Explain different types of over current protective schemes. **(08 Marks)**

b. Explain impedance relay characteristics in the R-X diagram. **(04 Marks)**

c. What are the advantages of numerical over current relays over conventional over current relays? **(04 Marks)**

OR

4 a. Explain stepped time-distance characteristics of three distance relaying units used for I, II and III zone of protection. **(06 Marks)**

b. Explain how reactance relay and MGO relay characteristics are realized using a sampling comparator. **(06 Marks)**

c. With neat diagram, explain an over current protective scheme for a ring feeder. **(04 Marks)**

Module-3

5 a. What are the important operating principles which are used in wire 'pilot' schemes? With schematic diagram, explain circulating current principle. **(06 Marks)**

b. Explain the working principle of 'Buchholz' relay used for the protection of transformer. **(05 Marks)**

c. With schematic diagram, explain balanced (opposed) voltage differential protection. **(05 Marks)**

OR

6 a. With neat sketch, explain frame leakage protection scheme. **(04 Marks)**

b. With schematic diagram, explain protection of stator against over heating in an alternator. **(06 Marks)**

c. What is simple differential protection scheme? Explain its behavior during normal condition. **(06 Marks)**

Module-4

7 a. With neat sketches, explain the recovery rate theory of arc interruption in a circuit breaker. **(06 Marks)**

b. What are the advantages and disadvantages of SF_6 circuit breaker? **(06 Marks)**

c. Explain the phenomenon of current chopping in a circuit breaker. **(04 Marks)**

OR

8 a. With neat circuit diagram explain synthetic testing of a circuit breaker. **(06 Marks)**

b. With neat sketch, explain the working principle of axial blast circuit breaker. **(05 Marks)**

c. With schematic diagram, explain the working of 'HVDC' circuit breaker. **(05 Marks)**

Module-5

9 a. With neat diagrams, explain the phenomenon of lighting. **(06 Marks)**

b. Describe the construction and working of the HRC cartridge fuse. **(05 Marks)**

c. With neat sketch, explain the construction and working of 'Klydonograph'. **(05 Marks)**

OR

10 a. What are the various components of GIS? Briefly describe their functions. **(07 Marks)**

b. With neat diagram, explain the working of expulsion type lighting arrester. **(05 Marks)**

c. What is insulation coordination? Explain is volt time curve. **(04 Marks)**

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15EE73

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Derive an expression for the current in the air gap that is $i = i_o e^{\alpha d}$ considering Townsend first ionization coefficient. **(07 Marks)**

b. What are the limitation of Townsend's theory? **(03 Marks)**

c. In an experiment in a certain gas it was found that the steady state current is 5.5×10^{-8}A at 8kV at a distance of 0.4cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1cm results in a current of 5.5×10^{-9}A. Calculate Townsend's primary ionization coefficient α. **(06 Marks)**

OR

2 a. Explain briefly suspended particle theory of breakdown in liquid dielectric. **(06 Marks)**

b. Explain the following breakdown mechanism in solid:
i) Electro mechanical breakdown
ii) Thermal breakdown. **(10 Marks)**

Module-2

3 a. With the help of a neat sketch, explain how cascade transformer generates High Voltage AC. **(06 Marks)**

b. What is Tesla coil? How are damped high frequency oscillation obtained from the Tesla coil? **(06 Marks)**

c. A Cockcroft-Walton type voltage multiplier has eight stages with capacitances, all equal to 0.05μF. The supply transformer secondary voltage is 125kV at a frequency of 150Hz. If the load current to be supplied is 5mA, find i) The percentage ripple ii) the regulation. **(04 Marks)**

OR

4 a. With neat sketch, explain the Mark's circuit arrangement for multistage impulse generator. **(07 Marks)**

b. With a neat diagram, explain the operation of trigatron gap. **(06 Marks)**

c. Define wave front and wave tail times of an impulse voltage wave. **(03 Marks)**

Module-3

5 a. With neat sketch, explain principle, working and construction of electrostatic voltmeter. **(06 Marks)**

b. Briefly explain the factors affecting measurement of voltage using sphere gap. **(05 Marks)**

c. Explain the working principle of generating voltmeter with a neat sketch. **(05 Marks)**

OR

6 a. Explain the Chubb-Fortscue method for measurement of peak value of an ac voltage waveform. **(06 Marks)**

b. With the help of a neat sketch, explain the working of Rogowski coil for high impulse current measurement. **(06 Marks)**

c. A generating voltmeter has to be designed so that it can have a range from 20 to 200kV dc. If the indicating meter reads a minimum current of 2μA and maximum current of 25μA, what should the capacitance of generating voltmeter be? **(04 Marks)**

Module-4

7 a. Explain the different theories of charge formation in clouds. **(08 Marks)**

b. Explain with suitable figures the principles and functioning of
i) Expulsion gaps ii) Protector tubes. **(08 Marks)**

OR

8 a. What is a surge arrester? Explain it function as a shunt protective device. **(08 Marks)**

b. Write short notes on:
i) Rod gaps used as protective devices.
ii) Ground wires for protection of overhead lines. **(08 Marks)**

Module-5

9 a. Discuss the method of discharge detection using straight detector. **(08 Marks)**

b. Explain the method of measuring dielectric loss at power frequency using high voltage Schering bridge. **(08 Marks)**

OR

10 a. Describe the various electrical tests done on transformers. **(08 Marks)**

b. Write a different methods of conducting a short circuit tests on circuit breakers. **(08 Marks)**

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15EE742

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Utilization of Electrical Power

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 sketch, explain the construction , working principle of Ajax Wyatt furnace. **(06 Marks)**

b. Explain with a neat sketch, how the spot welding is carried out by a Spot welding machine. **(04 Marks)**

c. A 45 KW , 3 phase , 415V resistance oven employs a nichrome strip of thickness 0.25mm for a 3 – phase star connected heating elements. If the wire temperature is to be 1200^0C and that of the charge to be 800^0C, estimate the length and width of the strip. Assume radiating efficiency of 0.57 and emissivity of 0.9. The specific resistance of nichrome is $1.03 \times 10^{-6}\ \Omega - m$. **(06 Marks)**

OR

2 a. State Faraday's laws of Electrolysis and explain :
i) Current efficiency ii) Energy efficiency. **(06 Marks)**

b. How much aluminum will be produced from aluminum oxide in 24 hrs if the average current is 3,500A and the current efficiency is 90 percent? Aluminum is Trivalent and its atomic weight is 27. The chemical equivalent of silver is 107.98 and 0.00111gm of silver is deposited by one Coulomb. **(04 Marks)**

c. A circular shaft of a diameter 12cm and 24cm long is to be coated with a layer of 1.6mm nickel. The current density is 200 A/m^2 and current efficiency is 95%. The specific gravity of nickel is 8.9 and its E.C.E is 1.0954 kg per 1,000 Ah. Determine the quantity of electricity required in Ah and time taken for the process in hours. **(06 Marks)**

Module-2

3 a. Two lamp posts are 20m apart and are fitted with lamps of luminous intensity 200 C.P. each at a height of 6m above the ground. Calculate the illumination on the ground i) under each lamp ii) midway between the lamps. **(06 Marks)**

b. Define i) Luminous Flux ii) Luminous intensity iii) Illumination iv) Brightness v) Reduction factor vi) Coefficient of utilization. **(06 Marks)**

c. Explain the working of fluorescent lamp with neat circuit diagram. **(04 Marks)**

OR

4 a. A workshop measuring 30 × 12m is to be provided with an illumination of 100 Lux on the working plane. The coefficient of utilization is 0.4 and the maintenance factor is 0.8 and the luminous efficiency of the lamps is 14 lumens per Watt. Calculate the number of lamps required and their deposition. **(06 Marks)**

b. With a neat figure, explain the construction and working principle of sodium vapour discharge lamp. **(05 Marks)**

c. i) What are the general requirements of factory lighting?
ii) What is flood lighting? **(05 Marks)**

Module-3

5 a. Derive an expression for the specific energy output. **(06 Marks)**

b. An electric train is accelerated from rest to a speed of 60 kmph in 30 seconds. The power is cut off and then the train coasts for 75 seconds against a constant resistance of 50 N/tone and then braked to rest at 4 kmphps in 15 seconds. Calculate the schedule speed, if the duration of station stops is 30 seconds. Allow 10% for rotational inertia. If the stations stop is reduced to 10 seconds , what is the new schedule speed? **(06 Marks)**

c. What are the advantage and disadvantages of Electric Traction? **(04 Marks)**

OR

6 a. Derive an expression for the tractive effort in terms of the weight of the train, acceleration , gradient and train resistance. **(06 Marks)**

b. Define Specific Energy consumption and explain the various factors on which it depends. **(06 Marks)**

c. Explain with the help of suitable circuit diagrams :
i) Shunt transition ii) Bridge transition as applied to a pair of d.c. traction motors. **(04 Marks)**

Module-4

7 a. Describe how plugging , rehostatic breaking and regenerative breaking are employed with d.c motors. **(06 Marks)**

b. Discuss Mechanical breaking arrangements used in electric traction. **(04 Marks)**

c. A 525 – V series traction motor has the following characteristics :

Current (A)	50	70	80	90
Speed (Kmph)	33.8	26.9	25.1	23.8
Torque (N – m)	216	344	422	500

What will be the braking torque at a speed of 26 kmph when operating as a self – excited series generator, the resistance of the braking rheostat being 5.5 ohms and that of the motor being 0.5Ω? **(06 Marks)**

OR

8 a. Show how sag and tension are calculated in trolly wires. **(06 Marks)**

b. Explain the function of a negative booster in a tramway system. **(06 Marks)**

c. Sketch and explain the following arrangements of current collection used in electric traction:
i) Trolley – wire section ii) The bow collector iii) Current collecting shoe
iv) Collector wheel and Trolley - wire. **(04 Marks)**

Module-5

9 a. Explain with neat diagram the concept of series Hybrid Electric Drive trains. **(06 Marks)**

b. Explain General Electric vehicle configuration with block diagram. **(06 Marks)**

c. Explain Traction Motor characteristics of Electric vehicles. **(04 Marks)**

OR

10 a. Explain the concept of energy consumption of Electric vehicles using suitable equations. **(06 Marks)**

b. Explain the concept of Hybrid Electric drive trains. **(04 Marks)**

c. Explain with a neat diagram, the concept of Speed – Coupling Parallel Hybrid Electric Drive trains. **(06 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
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 method of Artificial Respiration. **(08 Marks)**
b. Explain briefly special tools for live line maintenance. **(08 Marks)**

OR

2 a. What are the points to be considered in location and site selection for transformer installation? **(08 Marks)**
b. Explain Drying of Transformer. **(08 Marks)**

Module-2

3 a. Mention the specifications of synchronous machines. **(06 Marks)**
b. Explain briefly Testing of synchronous machines. **(10 Marks)**

OR

4 a. Explain about the sudden 3 phase short circuit test on generator. **(08 Marks)**
b. Explain cooling operation of synchronous machines. **(08 Marks)**

Module-3

5 a. Mention the specification of induction motor. **(08 Marks)**
b. Explain the concept of Installation of induction motor. **(08 Marks)**

OR

6 a. Write a short note on drying of winding induction motor. **(10 Marks)**
b. Explain the temperature rise test on induction motor. **(06 Marks)**

Module-4

7 a. Explain the various aspects to be considered in laying underground cables. **(08 Marks)**
b. Explain how to check cable fault by means of a megger. **(08 Marks)**

OR

8 a. List the various test conducted on power cables at works and at site. **(08 Marks)**
b. What precautions are necessary in cable jointing? **(08 Marks)**

Module-5

9 a. Mention the steps involved in installation of outdoor circuit breakers **(08 Marks)**
b. Briefly explain commissioning tests on circuit breakers. **(08 Marks)**

OR

10 a. Briefly explain the maintenance of circuit breakers. **(08 Marks)**
b. Explain protective devices Residential electrical Installation. **(08 Marks)**

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15EE81

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. With a neat diagram describe the major components of SCADA system. **(08 Marks)**

b. Explain the spinning reserve and thermal constraints in unit commitment. **(04 Marks)**

c. Discuss on different emergency control action initiated in a power system to prevent degradation of system. **(04 Marks)**

OR

2 a. With a flow chart explain the priority list method of unit commitment. **(08 Marks)**

b. What are the different states in which power system operates? Explain. **(08 Marks)**

Module-2

3 a. Deduce an expression for gradient vector in hydrothermal scheduling based on discrete time interval. **(08 Marks)**

b. Two generators rated 200 MW and 400 MW are operating in parallel. The droop characteristics of their governor are 4% and 5% respectively from no load to full load. The speed set points are such that the generators operate at 50Hz when sharing the full load of 600 MW in proportion to their ratings:

(i) If load reduces to 400 MW, who is the load shared, at what frequency will system operate.

(ii) If speed changer are reset so that load of 400 MW is shared at 50 Hz in proportion to their rating what is the no load frequency now? **(08 Marks)**

OR

4 a. Deduce an expression for hydro power generation and thermal power generation in lambda-gamma technique of hydro thermal scheduling. **(09 Marks)**

b. Two machines 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 characteristic of 4%. Their governors are adjusted so that frequency is 100% on full load. Calculate the load supplied by each unit and the frequency at this load. The system is a 50 Hz system. **(07 Marks)**

Module-3

5 a. Two areas A_1 and A_2 are interconnected by a Tie line T_{12}. Derive an expression for frequency change and Tie line power flow when the load in Area 1 changes. **(08 Marks)**

b. Two areas 1 and 2 are interconnected. The capacity of area 1 is 1500 MW and area 2 is 500 MW. The incremental regulation and damping torque coefficient for each area on its own base are 0.2 pu and 0.9 pu respectively. Find the steady state frequency and change in steady-state the line power, for an increase of 60 MW in area 1. Nominal frequency is 50 Hz. **(08 Marks)**

OR

6 a. Prove that by adding a feedback of proportional integral controller to ALFC, the steady state frequency deviation is zero. **(08 Marks)**

b. A control area has following data, total generation capacity = 2000 MW, normal load = 1500 MW, H = 4.8s, D = 1.2%, f = 50 Hz, R = 2.5 Hz/pu MW.

(i) Determine primary ALFC parameter

(ii) For increase of 0.02 pu unload, find frequency drop without governor control

(iii) With governor control. **(08 Marks)**

Module-4

7 a. Highlight the event of tie line oscillation in inter connected power system by deriving necessary equation. **(08 Marks)**

b. At a 3ϕ, 11 kV bus, a load drawing (2 + j1) MVA is connected. The 11 kV bus is supplied from a radial line. Total system reactance is 0.5 Ω/phase. Calculate the:

(i) Receiving end current

(ii) Regulation

(iii) Sending end voltage

(iv) Short circuit capacity of the system

Assume system to be loss less. **(08 Marks)**

OR

8 a. Prove that voltage at receiving end is dependent on reactive power in power system. **(08 Marks)**

b. Two control area of capacity 1500 MW and 10000 MW are interconnected through the line. The parameters of each area on its own capacity are R = 1 Hz/pu MW and D = 0.02 pu MW/Hz. There is an increase of 200 MW in load of area 2. Determine steady state frequency deviation and change in the line power. **(08 Marks)**

Module-5

9 a. With an example, explain how security constrained optional power flow is implemented. **(05 Marks)**

b. Explain system adequacy and system security in reliability analysis of power system. **(04 Marks)**

c. Discuss on major issues of state estimation. **(07 Marks)**

OR

10 a. With a flow chart explain contingency analysis for generator outage. **(08 Marks)**

b. Obtain an expression for state estimator problem by weighted least square technique in DC state estimation. **(08 Marks)**

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15EE831

Eighth Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Compare today's grid versus smart grid. **(07 Marks)**

b. Define smart grid and hence explain different architectural structures of smart grid enlisting functions of various components. **(09 Marks)**

OR

2 a. Explain the importance of Phase Measurement Unit (PMU) and smart meters in smart grid. **(08 Marks)**

b. With a flow chart, explain load flow for smart grid design. **(08 Marks)**

Module-2

3 a. Analyze and explain with a flow chart the necessity of new voltage stability analysis tool for a smart grid. **(09 Marks)**

b. Illustrate different voltage stability assessment techniques. **(07 Marks)**

OR

4 a. Discuss direct and indirect methods for detecting voltage collapse points in a grid. **(07 Marks)**

b. What is 'State Estimation'? Discuss the components that need to be included in state estimation for smart grid. **(09 Marks)**

Module-3

5 a. Explain the need for decision support tools and hence discus Analytical Hierarchical Programming (AHP) method. **(08 Marks)**

b. Discuss different classical and heuristic optimization methods and thereby explain linear programming and ANN (Artificial Neural Network) methods of optimization. **(08 Marks)**

OR

6 a. Illustrate the multilayered approach for designing smart grid mentioning barriers and solutions. **(09 Marks)**

b. Give a detailed explanation of factors to be considered for generation level automation in a smart grid. **(07 Marks)**

Module-4

7 a. Discuss power quality issues of grid connected renewable energy sources. With necessary equations, explain the modeling of a PV system. **(09 Marks)**

b. Compare different storage technologies used in a smart grid. **(07 Marks)**

OR

8 a. Define "Interoperability" and explain any three standard bodies that address the interoperability issues in a smart grid. **(08 Marks)**

b. Why cyber security is of prime importance in smart grid and how it can be mitigated? **(08 Marks)**

Module-5

9 a. Explain critical objectives of technical research activities in smart grid. **(08 Marks)**

b. Write a brief explanation on "Smart grid education". **(08 Marks)**

OR

10 a. With a neat diagram, explain a sample microgrid testbed environment. **(08 Marks)**

b. Explain the challenges and benefits of smart transmission. **(08 Marks)**

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15EE71

Seventh Semester B.E. Degree Examination, Aug./Sept. 2020
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. Define the following terms with an example:
(i) Oriented graph (ii) Tree (iii) Co-tree **(06 Marks)**

b. Fig. Q1 (b) shows a three bus power system, using Gauss-Seidal method determine the bus voltages at the end of first iteration. The values shown are line impedance in p.u.. Bus data are given in Table Q1 (b). **(10 Marks)**

Table Q1 (b)

Bus	Generation		Load		Voltage
	P_G(P.u)	Q_G(P.u)	P_D(P.u)	Q_D(P.u)	
1	-	-	-	-	$1.05\angle 0^0$
2	3	-	-	-	1.0
3	-	-	4	2	-

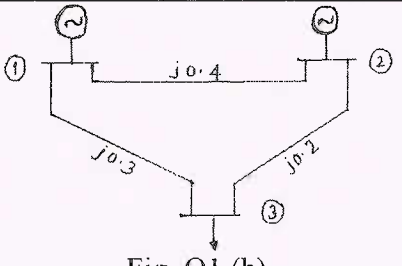

Fig. Q1 (b)

OR

2 a. With the help of singular transformation method, determine the bus admittance matrix Y_{bus} for the power system whose oriented graph is shown in Fig.Q2 (a). Element number and self impedance of the elements in p.u. are karked on the diagram. Neglect mutual coupling. **(08 Marks)**

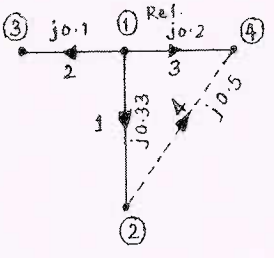

Fig. Q2 (a)

b. Explain the classification of different types of buses considered during power system load flow analysis. Discuss the need of slack bus in such an analysis. **(08 Marks)**

Module-2

3 a. Discuss clearly the significance and properties of Jacobian matrix as applied to load flow analysis. **(06 Marks)**

b. Stating all assumptions, deduce the FDLF model. Explain the step by step procedure for load flow solution using FDLF method. **(10 Marks)**

OR

4 a. Discuss the alogirhtm procedure for load flow analysis using Newton-Raphson's method in polar coordinates. Mention the conditions under which N-R method is superior over G-S method for load flow analysis. **(10 Marks)**

b. Explain any two methods of voltage control in power system. **(06 Marks)**

Module-3

5 a. Derive an expression for economical load schedule for an n-plant system neglecting the transmission losses and hence show that plant incremental cost is given by, $\lambda = \dfrac{P_D + \sum_{i=1}^{n} \frac{b_i}{2C_i}}{\sum_{i=1}^{n} \frac{1}{2C_i}}$

where, P_D is load demand in MW, b_i and c_i are coefficients of cost function. **(10 Marks)**

b. State unit commitment problem. In brief explain dynamic programming method. **(06 Marks)**

OR

6 a. Write down the transmission loss formula. Obtain the loss co-efficient formula for a system consisting of two generating plants for supplying several loads through a transmission line network. **(08 Marks)**

b. Briefly explain the two state generator models. With usual notation derive the expression for availability and unavailability in terms of failure and repair rate. **(08 Marks)**

Module-4

7 a. Explain the problem formulation and solution procedure of optimal scheduling for hydrothermal plants. **(09 Marks)**

b. Explain the state space method used for power system reliability evaluation. Explain Loss Of Load Probability (LOLP). **(07 Marks)**

OR

8 a. Write x flow chart for the optimal load flow solution. **(08 Marks)**

b. Define energy management system. Explain the major functions that are carried out in an energy control center of power system security. **(08 Marks)**

Module-5

9 a. Form Z_{bus} using building algorithm of the power system shown in Fig. Q9 (a). Self impedances of the elements are given in Table Q9 (a). Take element-3 as link and bus-1 as reference bus. **(08 Marks)**

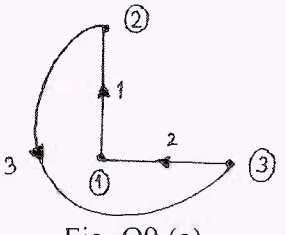

Fig. Q9 (a)

Table Q9 (a)

Element No.	1	2	3
Self impedance $Z_{pq\,pq}$	$j0.5$	$j0.25$	$j0.3$

b. Explain the point by point method of solving the swing equation. **(08 Marks)**

OR

10 a. Obtain the generalized algorithm expression for bus impedance matrix elements when a link is added to the partial network. Also discuss the special cases. **(08 Marks)**

b. Illustrate clearly the steps involved solving swing equation using Runge-Kutta method for transient analysis. **(08 Marks)**

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15EE742

Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Utilization of Electrical Power

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Mention the advantages of Electrical heating. **(04 Marks)**

b. With neat sketch, explain the working of a vertical core type induction furnace. **(06 Marks)**

c. Explain the principle of Dielectric Heating. Derive the mathematical expression of power consumed in such process. **(06 Marks)**

OR

2 a. Define Resistance welding and explain any one technique, with neat sketch and its applications. **(06 Marks)**

b. State and explain Faraday's laws of electrolysis. **(04 Marks)**

c. What is Electro deposition? Discuss the factors that influence electro deposition. **(06 Marks)**

Module-2

3 a. State and prove :

i) Inverse Square Law ii) Lamberts Cosine law with respect to Illumination. **(06 Marks)**

b. Discuss the requirements of good lighting. **(05 Marks)**

c. Two lamps posts are 16m apart and are fitted with 500 CP lamp each at a height of 6m above the ground. Calculate :

i) Illumination Mid – way between the posts.

ii) Illumination under each lamp. **(05 Marks)**

OR

4 a. Define the following terms :

i) Lux or Metro candle.

ii) Mean Horizontal Candle Power (MHCP).

iii) Brightness or Luminance (L). **(03 Marks)**

b. With neat figure, explain construction and working of Fluorescent Lamp. **(07 Marks)**

c. Two Lamps L_1 & L_2 are hung at a height of 9 meter from the floar level. The distance between the lamp is 1m. Lamp L_1 is of 500 CP. If the illumination on the floor vertically below this lamp is 20 Lux, find the candle power of Lamp L_2. **(06 Marks)**

Module-3

5 a. Define for a train the following :

i) Tractive effort ii) Dead weight iii) Adhesive weight

iv) Co-efficient of adhesion. **(04 Marks)**

b. What is Speed – time Curve? With graph, explain Speed – time Curve. **(04 Marks)**

c. Derive an expression for distance traveled between two stations. Assume trapezoidal speed time curve. **(08 Marks)**

OR

6 a. With a neat figure, explain the construction and working of a Single Phase AC series motor. **(06 Marks)**

b. With relevant figure, explain the steps involved in bridge transition method of Series – Parallel starting of two DC Series motors. **(06 Marks)**

c. An electric train has a max speed of 70 kmph. The schedule speed and stop at station are 450 Mph and 30 sec respectively. If the acceleration is 1.5Kmph. Find the value of retardation when the distance between stops is 4km. **(04 Marks)**

Module-4

7 a. What is Regeneration Braking System? Derive the expression for energy returned during regeneration. **(08 Marks)**

b. Explain the working of linear Induction Motor. Mention its application in traction. **(08 Marks)**

OR

8 a. Explain the various systems of track Electrification. **(04 Marks)**

b. Write a note on Tram ways and Trolley buses. **(06 Marks)**

c. Compare the D.C and A.C systems of railway electrification from the point of main line and sub – urban line railway services. **(06 Marks)**

Module-5

9 a. Explain with block diagram of Electric Vehicles configuration. **(08 Marks)**

b. Explain tractive effort and transmission requirements for electric vehicle. **(06 Marks)**

c. Mention the advantages of Electric vehicle. **(02 Marks)**

OR

10 a. Explain the concept of Hybrid Electric Drive trains. **(08 Marks)**

b. Explain with block diagram of Series Hybrid Electric Drive trains. **(08 Marks)**

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15EE81

Eighth Semester B.E. Degree Examination, Aug./Sept.2020
Power System Operation and Control

Time: 3 hrs. Max. Marks: 80

Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Briefly describe the major components of a SCADA system. **(08 Marks)**
b. What are the various transducers used in power system SCADA? **(04 Marks)**
c. Discuss the various options available for communication in SCADA. **(04 Marks)**

2 a. Draw the flowchart for the priority list method of unit commitment and explain. **(08 Marks)**
b. Draw and explain the flowchart for the forward dynamic programming algorithm. **(08 Marks)**

Module-2

3 a. Explain algorithm for hydro thermal scheduling using Discrete Time Interval method. **(10 Marks)**
b. Draw flow chart for 8-λ interactions. **(06 Marks)**

4 a. What are the functions of AGC? **(04 Marks)**
b. Draw the block diagram of steam turbine governing system and explain the functions of the various components. **(08 Marks)**
c. What are the two modes of governor operation and explain. **(04 Marks)**

Module-3

5 a. Derive the transfer function for the complete ALFC block. **(08 Marks)**
b. Two generators rated 1000 MW and 500 MW are operating on parallel with a droop of 5% and 4% respectively. The frequency in 1 PU, 50 HZ at no-load. How is a load of 800 MW shared between them? At what frequency? **(08 Marks)**

6 a. Draw the block diagram of a two area system with primary control loop. **(08 Marks)**
b. The data of a two area system are as follows,
Area 1: $PG_1 = 1000$ MW, $R_1 = 0.015$, $D_1 = 0$
Area 2: $PG_2 = 10000$ MW, $R_2 = 0.0015$, $D_2 = 0$
An increase of 10 MW takes place in area1. Determine the change in frequency. ACE and the appropriate control action. **(08 Marks)**

Module-4

7 a. Two control areas of capacity 1500 MW and 10000 MW are interconnected through the tie-line. The parameters of each area on its own capacity are R = 1 Hz/PUMW and D = 0.02 PUMW/Hz. There is an increase of 200 MW. In load of area 2. Determine the steady state frequency deviation and change in tie-line power. **(08 Marks)**
b. What are the tie-line oscillations? What determines the frequency of these oscillations? **(08 Marks)**

8 a. Explain generation and absorption of reactive power in electrical power system. **(06 Marks)**

b. 3 – generating stations are connected to a common bus-bar X, as shown on Fig.Q8(b) for a particular system load, the line voltage at the bus bar falls by 2 KV. Calculate the reactive power injection required to bring back the voltage to the original value. All PU values are on a 500 MVA base.

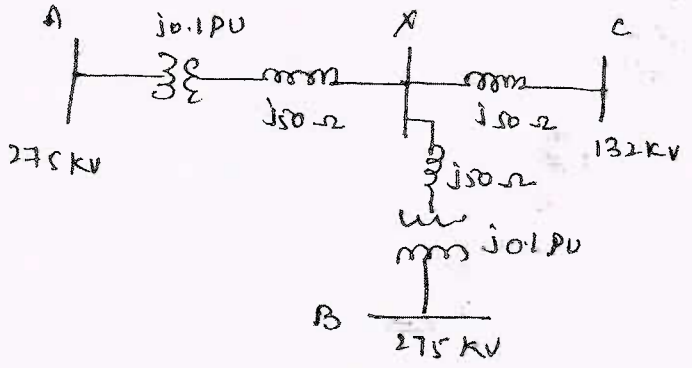

Fig.Q8(b) **(10 Marks)**

Module-5

9 a. Explain the factors affecting power system security. **(06 Marks)**

b. With the help of flow chart, explain the contingency analysis. **(10 Marks)**

10 a. Explain calculation of linear sensitivity factor and contingency ranking. **(08 Marks)**

b. What are state variables? **(02 Marks)**

c. Describe the D.C. State estimator. **(06 Marks)**

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15EE82

Eighth Semester B.E. Degree Examination, Aug./Sept. 2020
Industrial Drives and Applications

Time: 3 hrs. Max. Marks: 80

Note: *i) For Regular Students: Answer any FIVE full questions irrespective of modules.*
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Write the block diagram of an electrical drive and mention the functions of power modulator. **(04 Marks)**

b. A motor drives two loads, one has rotational motion and the other translational motion. Moment of inertia of motor is 1.2 kg.m^2. Motor runs at a speed of 1000 rpm. The load with rotational motion has an inertia of 7 kg.m^2 and a torque of 10N.m at a speed of 200 rpm. The load with translational motion moves at a speed of 10m/sec with the weight of 10 kg and a force of 20 N. Calculate the equivalent inertia and torque of the system, referred to the motor shaft and power rating of the motor assuming negligible loss in the transmission system. **(05 Marks)**

c. With a neat diagram, explain the four quadrant operation of a motor driving a hoist load. **(07 Marks)**

2 a. Derive expressions for equivalent values of moment of inertia and torque as referred to motor shaft for loads with rotational motion. **(07 Marks)**

b. A motor equipped with a flywheel is to supply a load torque of 1000N.m for 10 sec followed by a light load period of 200 N.m long enough for the flywheel to regain its steady state speed. It is desired to limit the motor torque to 700 N.m. What should be the moment of inertia of flywheel? Motor has an inertia of 10 kg-m^2. Its no load speed is 500 rpm and slip at a torque of 500 N.m is 5%. Assume speed-torque characteristic of motor to be straight line in the region of interest. **(05 Marks)**

c. Explain how a current limit control functions in closed loop control of drives. **(04 Marks)**

Module-2

3 a. Derive an expression for temperature rise of a motor during normal operation. **(10 Marks)**

b. A 50KW, 3 phase, 440V, 50Hz, 1440 rpm squirrel – cage induction motor has constant loss to variable loss at full load in the proportion 1 : 3. Its rated temperature rise is 55°C and its heating and cooling time constants are 40 and 60 minutes respectively. Find the intermittent rating if periodic load of half hour duration are applied at an interval of half hour. **(06 Marks)**

4 a. Explain with drive current and relevant waveforms (discontinuous current) a single phase fully controlled rectifier control of a separately excited DC motor. **(08 Marks)**

b. A 230V, 74A. 1750rpm separately excited motor with armatures resistance of 0.18 ohm is supplied through a 3 phase fully controlled rectifier from as AC source of 208V line 50Hz. The motor is operating in continuous conduction mode. The field is excited to a voltage which gives rated operation. If the motor is delivering full load torque determine the speed for : i) $\alpha = 45°$ ii) $\alpha = 135°$. **(08 Marks)**

Module-3

5 a. With relevant equations, explain the operation of a 3 phase induction motor with unbalanced source voltages. **(08 Marks)**

b. With a neat schematic diagram of star – delta starter explain its working. **(04 Marks)**

c. Explain the braking of 3 ph induction motor by plugging. **(04 Marks)**

6 a. Explain the AC dynamic braking of 3 phase induction motor with two load connection. **(08 Marks)**

b. Discuss the variable frequency control of a 3 ph induction motor supplied from voltage source. **(08 Marks)**

Module-4

7 a. With a neat circuit diagram and relevant waveform explain the operation of VSI driven induction motor. **(08 Marks)**

b. Draw the block diagram and explain the closed loop speed control of voltage source induction motor drive. **(08 Marks)**

8 a. Explain the starting operation of a synchronous motor with damper winding from a fixed frequency supply. **(08 Marks)**

b. Explain the two modes variable frequency control of a synchronous motor. **(08 Marks)**

Module-5

9 a. With a neat circuit diagram, explain the self controlled synchronous motor drive employing load commutated inverter. **(08 Marks)**

b. With a neat diagram explain the multi-stack stepper motor. **(08 Marks)**

10 a. What are the advantages of stepper motor? With a neat figure explain permanent magnet stepper motor. **(06 Marks)**

b. What are the different types of steel rolling mills? Explain any one type and requirements of motor for that drive. **(06 Marks)**

c. What are the required features of the motors used in machine tools? **(04 Marks)**

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15EE831

Eighth Semester B.E. Degree Examination, Aug./Sept. 2020
Smart Grid

Time: 3 hrs. Max. Marks: 80

Note: *Note: i) For Regular Students: Answer any FIVE full questions irrespective of modules.*
ii) For Arrear Students : Answer any FIVE full questions, choosing ONE full question from each module..

Module-1

1	a.	List out the comparison between Today's grid and Smart grid.	(05 Marks)
	b.	Explain the contingency studies for the smart grid.	(05 Marks)
	c.	Explain load flow for smart grid design with flow chart.	(06 Marks)
2	a.	What are the rationale for the smart grid.	(05 Marks)
	b.	Explain in detail, five key aspects of smart grid development.	(05 Marks)
	c.	Explain the Roles of stakeholders and their functions.	(06 Marks)

Module-2

3	a.	What are the strengths and weakness of existing voltage stability analysis tools?	(08 Marks)
	b.	Explain in detail voltage stability assessment techniques.	(08 Marks)
4	a.	Discuss optimization of voltage stability constraints through preventive control.	(08 Marks)
	b.	Explain state estimation methods and approach of the smart grid to state estimation.	(08 Marks)

Module-3

5	a.	Explain in detail classical optimization methods.	(08 Marks)
	b.	Explain the distribution system automation requirement of the power grid.	(08 Marks)
6	a.	Explain in detail heuristic optimization methods.	(08 Marks)
	b.	What are the barriers and solutions to smart grid development?	(08 Marks)

Module-4

7	a.	List out and explain the sustainable energy options for smart grid.	(08 Marks)
	b.	Explain in detail storage technologies in power system.	(08 Marks)
8	a.	Explain interoperability and approach to smart grid interoperability standards.	(08 Marks)
	b.	Explain in detail smart grid cyber security.	(08 Marks)

Module-5

9	a.	List out the research areas for smart grid development.	(08 Marks)
	b.	List the research activities in the smart grid.	(08 Marks)
10	a.	What are the approaches for smart grid application? Explain in detail.	(08 Marks)
	b.	List out the challenges and benefits of smart transmission.	(08 Marks)

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