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10EE71

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With neat sketches, explain the following:
i) Oriented graph
ii) Basic cut sets
iii) Tree branch path incidence matrix. **(06 Marks)**

b. The bus incidence matrix of 8 elements and 5 nodes is given below. Reconstruct the graph of the network.

n \ b	1	2	3	4	5	6	7	8
A	-1	0	0	0	1	0	1	0
B	0	-1	0	0	-1	1	0	1
C	0	0	-1	1	0	-1	0	0
D	0	0	0	-1	0	0	-1	-1

(06 Marks)

c. For the network shown in Fig.Q1(c), obtain the matrices A, B and C. Assume G as reference bus and AB, DF as links.

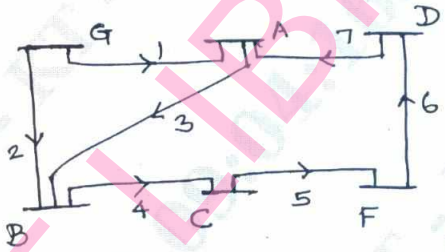

Fig.Q1(c) **(08 Marks)**

2 a. For the data given below, obtain the YBUS using singular transformation. Take bus 4 as reference bus.

Line	Bus (p – q)	Z_{pu}	Bus (r – s)	Z_{pu}
1	1-2	0.2		
2	2-3	0.3	1-2	0.05
3	3-4	0.4		
4	4-1	0.5		

(10 Marks)

b. Form the Z_{BUS} for the power system shown in Fig.Q2(b). Select node 1 as reference bus. The line reactances are marked in p.u.

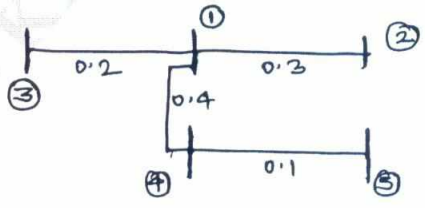

Fig.Q2(b) **(10 Marks)**

3 a. What is the importance of load flow in power system? Enumerate the data required to carry load flow analysis. **(08 Marks)**

b. Following is a system flow data of load flow solution:

Bus code	Admittance
1-2	2 – jB
1-3	1 – j4
2-3	0.666 – j2.664
2-4	1 – j4
3-4	2 - jB

The schedule of active and reactive power are as follows:

Bus code	P	Q	V	Remarks
1	-	-	1.06	Slack
2	0.5	0	1.04+j0	PV
3	0.4	0.3	-	PQ
4	0.3	0.1	-	PQ

The reactive power constraint at bus 2 is $0.1 \le Q_2 \le 1.0$ pu. Determine the voltage at the end of first iteration using Gauss-Seidel iterative method. Assume acceleration factor $\alpha = 1.4$. **(12 Marks)**

4 a. Explain the fast decoupled load model with stating all the assumptions made. **(08 Marks)**

b. In the system shown in Fig.Q4(a), bus 1 is slack bus with a voltage of $V = 1.0\angle 0^\circ$ pu and at load bus P = 125 MW, Q = 60 MVAv. The line impedance are (0.15 + j0.19) pu on the base of 100 MVA, using Newton-Raphson method obtain |V| and δ upto first iteration.

Fig.Q4(a) **(12 Marks)**

PART – B

5 a. What is the need of economic operation of power systems? Explain four types of performance curves used for economic generation scheduling. **(10 Marks)**

b. The fuel cost functions for the three plants in Rs./hr are given by

$F_1 = 0.004\ PG_1^2 + 5.3\ PG_1 + 500$

$F_2 = 0.006\ PG_2^2 + 5.5\ PG_2 + 400$

$F_3 = 0.009\ PG_3^2 + 5.8\ PG_3 + 200$

where PG_1, PG_2, PG_3 are in MW. Find the optimal dispatch and total cost, when the total load is 975 MW, with the following generator limits

$100\ MW \le PG_1 \le 450\ MW$; $100\ MW \le PG_2 \le 350\ MW$; $100\ MW \le PG_3 \le 225\ MW$. **(10 Marks)**

6 a. What are B-coefficients? Obtain the expressions for the transmission loss coefficients for a 3 bus system. **(10 Marks)**

b. A power system having two plants 1 and 2 corrected to the busses 1 and 2 respectively as shown below. There are two loads and four branches. The ref bus with a voltage of $1.0\angle 0^\circ$ pu is shown in the diagram. The branch currents and impedances are:

$I_a = (2 - j0.5)$ pu $\quad I_b = (1.6 - j0.4)$ pu

$I_c = (1 - j0.25)$ pu $\quad I_d = (3.6 - j0.9)$ pu

$Z_a = (0.015 + j0.06)$ pu $= Z_b \quad Z_c = (0.01 + j0.04)$ pu $= Z_d$

Calculate the loss coefficients of the system in pu, if the base MVA is 100 MVA. **(10 Marks)**

7 a. With the help of a flow chart, explain the method of finding the transient stability of a given power system using Runge Kutta method. **(10 Marks)**

b. Consider a system having the following parameters. p_m = 3.0 pu, $\gamma_1 p_m$ = 1.2 pu, $\gamma_2 p_m$ = 2.0 pu, H = 3.0, f = 60 Hz, Δt = 0.02 sec, p_e = 1.5 pu. Determine the rotor angle and angular frequency at the end of 0.02 second using modified Euler's methods. **(10 Marks)**

8 a. Explain the following:
i) Network performance equations
ii) Load models employed for stability studies **(10 Marks)**

b. Explain various methods employed for improving the transient stability. **(10 Marks)**

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10EE72

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

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With a neat sketch, explain the working of indirect resistance heating. **(06 Marks)**

b. Discuss methods of temperature control of resistance oven. **(06 Marks)**

c. A 16 KW resistance oven employing nicrome wire is to be operated from a 220 V, 1φ power supply. If the temperature of the element is to be limited to 1170° and average temperature of the charge is 500°C. Find the diameter and length of the element wire. Radiating efficiency is 0.57 and emissivity is 0.9 specific resistance of Nicrome is 109×10^{-8} ohm-m. **(08 Marks)**

2 a. Explain the factors affecting the appearance of deposition in electro deposition. **(06 Marks)**

b. Explain briefly the various applications of electrolysis. **(06 Marks)**

c. Explain the terms used in electrolytic process:
(i) Throwing of power.
(ii) Current efficiency.
(iii) Energy efficiency
(iv) Electro chemical equivalent **(08 Marks)**

3 a. State and explain:
(i) Inverse square law.
(ii) Lamberts cosine law, with respect to illumination. **(06 Marks)**

b. Explain the direct lighting and indirect lighting schemes. **(06 Marks)**

c. Two lamp posts 20 m apart and are fitted with 200 CP lamp each at height of 6 m above the ground. Calculate the illumination on the ground:
(i) Under each lamp (ii) Midway between the lamps. **(08 Marks)**

4 a. With a neat diagram, explain the construction and working of the sodium vapour lamp. **(06 Marks)**

b. Define the following terms:
(i) MHCP
(ii) MSCP
(iii) Candle power. **(06 Marks)**

c. An illumination on the working plane of 75 lux is required in a room 72 m × 15 m in size. The lamps are hung at 4 m above the work bench. Assume a space height ratio around unity, utilization factor of 0.5. Consider a lamp efficiency of 14 lumens/watt and a candle power depreciation of 20%. Estimate the members rating and with a neat sketch show the deposition of the lamps. **(08 Marks)**

PART – B

5 a. Mention advantages and limitations of electric traction. (06 Marks)

b. With circuit connections, explain plugging and regenerative braking as applied to tractive motors. (08 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 made to a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 64 kmph, acceleration 2 kmphs, coasting and braking retardation to 0.16 kmphps and 3.2 km phps respectively. Determine the duration of acceleration, coasting and braking periods. (06 Marks)

6 a. Define specific energy consumption and mention the factors affecting it. **(06 Marks)**

b. Explain the terms:

(i) Adhesive weight

(ii) Tractive effort. **(06 Marks)**

c. An electric train has an average speed of 45 kmph on a level track between stops 1.8 km apart. It is accelerated 2 kmphps and braked at 3 kmphps. Draw the speed time curve for the run. Estimate the energy consumption at axles of the train per tonne-km. Take tractive resistance as 45 N/tonne and allow 10% for rotational inertia. **(08 Marks)**

7 a. Assuming a quadrilateral speed time curve, derive equation for,

(i) Total distance travelled by the train between two stops

(ii) Velocity at the time of braking. **(10 Marks)**

b. Explain :

(i) Shunt transition.

(ii) Bridge transition.

applied to series parallel starting of D.C. motors with neat figures. **(10 Marks)**

8 a. With relevant graphs, explain traction motors characteristics. **(06 Marks)**

b. Discuss the concept and its subsystem of modern electric drives in detail. Draw relevant figure. **(08 Marks)**

c. Write a note on Hybrid vehicles. **(06 Marks)**

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10EE73

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

High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Discuss the important applications of high voltages. **(06 Marks)**

b. Explain the need for generating high voltages in the laboratory. **(06 Marks)**

c. What is electrostatic precipitator? Explain the operating principle of electrostatic precipitator and electrostatic painting. **(08 Marks)**

2 a. Define townsends first and second ionization coefficient. Derive Townsend's current in air gap considering secondary ionization process. **(08 Marks)**

b. State and explain Paschen's law with necessary diagram. **(06 Marks)**

c. Explain breakdown mechanism in electronegative gases. **(06 Marks)**

3 a. List the important properties of liquid dielectrics. **(04 Marks)**

b. Explain cavitation and bubble mechanism of breakdown in liquid dielectrics. **(06 Marks)**

c. Explain the following breakdown mechanism in solid dielectrics:
   i) Avalanch breakdown
   ii) Thermal breakdown **(10 Marks)**

4 a. What is the necessity of cascade connection? With neat schematic diagram, explain cascade connection of transformers for generation of high voltages ac. **(06 Marks)**

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

c. A ten stage Cockroft-Walton circuit has all capacitors of 0.055 μF the secondary voltage of the supply is 125 KV at a frequency of 200 Hz. If the load current is 2 mA, determine:
   i) The voltage regulation
   ii) The % ripple
   iii) The optimum number of stages for maximum output voltage
   iv) The maximum output voltage **(08 Marks)**

PART – B

5 a. Explain Marx circuit arrangement for multistage impulse generator. **(07 Marks)**

b. An 8-stage impulse generator has 0.12 μF capacitors rated for 167 KV. What is the maximum discharge energy? If it has to produce a 1/50 μsec waveform across a load capacitor of 15000 PF, find the values of wave front and wave tail resistances. **(06 Marks)**

c. What is trigatron gap? Explain its function and operation. **(07 Marks)**

6 a. Explain with schematic diagrams, construction and working principle of generating voltmeter. **(08 Marks)**

b. Explain how peak value of high voltage AC is measured using Chubb and Fortescue method. **(06 Marks)**

c. Discuss the factors affecting the measurement of high voltage using sphere gap. **(06 Marks)**

7 a. With the help of a neat schematic diagram describe how dielectric loss and capacitance of an insulator can be measured using a high voltage Schering bridge. **(08 Marks)**

b. Define partial discharge. Explain how it is measured using straight detection method. **(06 Marks)**

c. With the help of equivalent circuit describe resistance voltage divider for measurement of fast rising voltages. **(06 Marks)**

8 a. What are the various power frequency and impulse tests done on insulator? Describe the procedure for impulse tests. **(08 Marks)**

b. Write short notes on the following:
   i) High voltage tests on cables
   ii) Impulse current generator
   iii) Rogowski coils **(12 Marks)**

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10EE74

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Industrial Drives and Applications

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the speed-torque conventions and multi-quadrant operation on a motor, driving a hoist load. **(06 Marks)**

b Explain the different power modulators that are used in drive system. **(10 Marks)**

c. A drive has following parameters:
$J = 10$ kg-m^2, $T = 100 - 0.1$ N, N-m, Passive load torque $T_l = 0.05$ N, 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 characteristics is changed to $T = -100 - 0.1N$, N-m. Calculate the time of reversal. **(04 Marks)**

2 a. By assuming machine to be homogeneous body, obtain the thermal model for heating and cooling of an electrical motor. **(06 Marks)**

b. What are the load torque components? Define active and passive load torque. **(08 Marks)**

c. Half hour rating of a motor is 100 kW. Heating time constant is 80 min and the maximum efficiency occurs at 70% full load. Determine the continuous rating of the motor. **(06 Marks)**

3 a. With dynamic equivalent circuit, explain the transient analysis of separately excited dc motor with armature control. **(08 Marks)**

b. Explain single phase half-controlled rectifier control of dc separately excited motor with continuous and discontinuous conduction. **(12 Marks)**

4 a. Explain the chopper control of separately excited dc motor for regenerative braking. **(08 Marks)**

b. A 230 V, 960 rpm and 200 A separately excited dc motor has an armature resistance of 0.02 Ω. The motor is fed from a chopper which provides both motoring and braking operations. The source has a voltage of 230 V. Assuming continous conduction.
(i) Calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm.
(ii) Calculate duty ratio of chopper for braking operation at rated torque and 350 rpm. **(06 Marks)**

c. Explain the rectifier control of dc series motor and draw its speed torque curves. **(06 Marks)**

PART – B

5 a. Obtain the analysis and performance of a three phase induction motor when operated from unbalanced source voltages. **(10 Marks)**

b. With a neat diagram, explain star-delta, Auto transformer method of starting of three-phase induction motor. **(10 Marks)**

6 a. Explain the variable frequency control of an induction motor and draw the speed torque curves. **(10 Marks)**

b. Explain the operation of voltage source inverter fed induction motor drives. Also sketch various schemes of VSI fed induction motor drive. **(10 Marks)**

7 a. With a neat block diagram, explain the true synchronous mode variable frequency control of multiple synchronous motors. **(05 Marks)**

b. Explain the self controlled synchronous motor drive employing load commutated thyristor inverter. **(10 Marks)**

c. A 500 kW, 3-phase, 3.3 KV, 50 Hz, 0.8 (lagging) power factor, 4 pole, star-connected synchronous motor has following parameters, $X_S = 15\Omega$, $R_S = 0$, Rated current is 10 A, calculate

(i) Armature current and power factor at half the rated torque and rated current.

(ii) Torque for unity power factor operation at field current of 12.5 A. **(05 Marks)**

8 a. Explain the driving motors used in the cement industry for different operation. **(10 Marks)**

b. Write a technical note on:

(i) Rolling mill drives.

(ii) Paper mill drives. **(10 Marks)**

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10EE756

Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Testing and Commissioning and Electrical Equipments

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Explain what are the points to be considered in the selection of site, locations of power transformer. **(10 Marks)**

b. What are the standard specifications of a power transformer? **(06 Marks)**

c. List the qualities of good transformer oil. **(04 Marks)**

2 a. Describe the test set up for "Impulse testing" on power transformer. **(08 Marks)**

b. With a neat sketch, explain the Buchholz's relay used for protection. **(08 Marks)**

c. Explain the procedure of any one drying out method of a power transformer. **(04 Marks)**

3 a. What are the various cooling arrangements employed for synchronous machines. **(08 Marks)**

b. Describe the procedure for "slip test". **(08 Marks)**

c. State the various enclosure adopted in a generators. **(04 Marks)**

4 a. Explain sudden short circuit test with a circuit and how to calculate X''_d, X'_d and X_d. **(12 Marks)**

b. Explain the various steps of installation of a synchronous machine. **(08 Marks)**

PART – B

5 a. Explain the requirements of civil engineering works and foundation work for medium and large induction motors. **(10 Marks)**

b. What is drying out? Explain the different drying out methods adopted in induction motors. **(10 Marks)**

6 a. Explain how static and dynamic balancing of rotor of induction motor is done. **(10 Marks)**

b. State the various steps involved in the installation and commissioning of induction motors. **(10 Marks)**

7 a. Explain the procedure, how noload and blocked rotor tests are used to determine the efficiency of a given induction motor. **(10 Marks)**

b. Explain the various steps used in maintenance of circuit breakers. **(10 Marks)**

8 Write short notes on the following :

a. Hydrogen gas is best coolant in turbogenerators

b. Specifications of high voltage circuit breaker

c. Polarization index

d. List the different types of test conducted in circuit breaker. **(20 Marks)**

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10EE761

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

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain with the help of flow chart the least-cost utility planning. **(10 Marks)**

b. Explain the different tools for power system planning. List out the constraints in planning all energy system. **(10 Marks)**

2 a. With help of block diagram, explain distributed power generation planning, listing plan options, and uncertainties of attributes. **(10 Marks)**

b. What is co-generation? Describe two co-generation techniques. **(10 Marks)**

3 a. Write a note on Rural electrification investment. **(06 Marks)**

b. Write a note on private participation in power sector. **(08 Marks)**

c. Discuss in brief rational tariff. **(06 Marks)**

4 a. Mention the choice of technology in order to minimize emissions. Explain the method of post-combustion clean up process to reduce gaseous pollutants. **(10 Marks)**

b. Explain with the help of V-T curve the need of insulation coordination in power system. **(10 Marks)**

PART – B

5 a. What do you understand by power system reliability? Discuss the terms system adequacy and system security as applied to power system reliability. **(10 Marks)**

b. Explain in brief following real time operations : (i) State estimation (ii) AGC (iii) Economics load dispatch (iv) Stability **(10 Marks)**

6 a. With help of schematic diagram, explain load management technique. **(06 Marks)**

b. Explain reactive power balance power system. **(06 Marks)**

c. With the help of block diagram, explain computerized management of power system. **(08 Marks)**

7 a. Explain the methodology to be adopted for optimal expansion planning of power system . **(10 Marks)**

b. Discuss reactive power balance planning clearly indicating the constraints for optimization. **(10 Marks)**

8 a. Explain least cost optimization problem. **(10 Marks)**

b. Explain in brief any two optimization techniques. **(10 Marks)**

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10EE764

Seventh Semester B.E. Degree Examination, Dec.2018/Jan. 2019
VLSI Circuits and Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. With neat diagrams, explain the working of enticement mode nMOS transistor, for different values of V_{DS}. **(08 Marks)**

b. Explain the nMOS fabrication process with neat diagram. **(10 Marks)**

c. Compare CMOS and bipolar techniques. **(02 Marks)**

2 a. Discuss the drain to source I_{ds} versus V_{ds} relationship for non saturated and saturated regions. **(10 Marks)**

b. Define Z_{pu} Z_{dp}. Show that pull-up to pull-down ratio for nMOS inverter driven through one or more pass transistor is $\frac{Z_{pu_2}}{Z_{pd_2}} = 8:1$. **(10 Marks)**

3 a. With neat diagrams express the Lambda based design rules as applicable to MOS layers, transistors, and contracts. **(10 Marks)**

b. Draw circuit symbol and stick diagram for CMOS inverter. **(04 Marks)**

c. Draw the stick diagram and layout for an nMOS two way selector, with enable input. **(06 Marks)**

4 a. What is sheet resistance? Calculate sheet resistance of transistor channel if L = 8λ, W = 2λ, if n transistor channel $R_s = 10^4\Omega$/square. **(06 Marks)**

b. Derive an expression for rise time and fall time of CMOS inverter. **(06 Marks)**

c. Write a note on BiCMOS drivers. **(08 Marks)**

PART – B

5 a. Explain different scaling models by considering the relevant diagram of an nMOS transistor. **(06 Marks)**

b. Obtain the scaling factors for the following transistor parameters, by considering the constant voltage scalling model :
   i) Gate area
   ii) Gate capacitance per unit area
   iii) Gate capacitance. **(06 Marks)**

c. By considering a suitable example, compare the metal inter connect and elector-optical interconnect models. **(08 Marks)**

6 a. Explain the structured design approach for a parity generator circuit and draw the nMOS diagram of the basic cell. **(10 Marks)**

b. Explain the structured design of bus arbitration logic for n lines. Also write the circuit diagram and stick diagram for a single cell. **(10 Marks)**

7 a. Explain the basic bus architecture for 4 bit arithmetic process with neat diagrams. **(10 Marks)**

b. Explain with neat diagram 4 × 4 barrel shifter. **(10 Marks)**

8 a. Define explain regularity. **(04 Marks)**

b. Explain the design of 4-bit adder with adder element requirements. **(08 Marks)**

c. Draw the structure of a multiplexer based adder logic with stored and buffered sum output. **(08 Marks)**

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