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10EE71

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the following with example :
i) Oriented graph ii) Basic loop iii) Co tree. **(06 Marks)**

b. Two primitive elements p – q and r – s are given with mutual admittance $Y_{pq, rs}$ between them. Represent the elements in admittance form and obtain the primitive performance equations in matrix form. **(06 Marks)**

c. For the power system shown in fig. Q1(c), choosing bus – 1 as reference bus, obtain Incidence matrices B, C and K. Hence verify the identity $B^t C = 0$. **(08 Marks)**

Fig.Q1(c)

2 a. With usual notation, deduce the expression for Y_{bus} using singular transformation method. **(06 Marks)**

b. With the help of singular transformation method, determine the bus admittance matrix Y_{bus} for the power system shown in fig. Q2(b). Self impedances and element numbers are marked on the diagram. Take node – 1 as reference node. Neglect mutual coupling. **(08 Marks)**

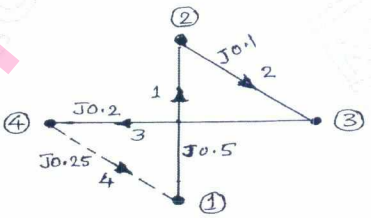

Fig.Q2(b)

c. Form Z_{bus} using building algorithm of the power system shown in fig. Q2(c). Self impedances of the elements are given in the table below. Take element – 3 as link and bus – 1 as reference bus. **(06 Marks)**

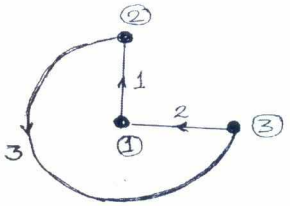

Fig.Q2(c)

Table Q2(c)

Element No.	1	2	3
Self Impedance $Z_{pq, pq}$	J0.5	J0.25	J0.3

3 a. Why load flow analysis in a power system is necessary? Explain. **(04 Marks)**

b. What is the data required to conduct load flow analysis? Discuss the need of acceleration factor in load flow solution. **(04 Marks)**

c. For the three bus system shown in fig. Q3(c), use Gauss – Siedel method and determine the voltages at bus – 2 and bus – 3 at the end of first iteration. Line impedances marked on the diagram are in pu. The information relating to bus data is given in table Q3(c). **(12 Marks)**

Fig.Q3(c)

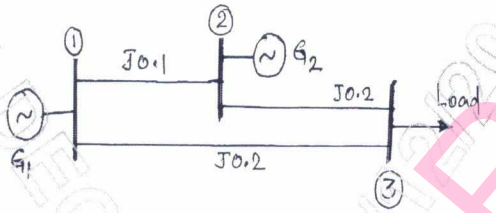

Table Q3(c)

Bus No	Type	Generation		Load		Voltage Magnitude	Reactive Power LIMIT	
		P	Q	P	Q	|V|	Q_{min}	Q_{max}
1	Slack	-	-	-	-	1.0	-	-
2	PV	5.32	-	-	-	1.1	0	5.32
3	PQ	-	-	3.64	0.53	-	-	-

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

PART – B

5 a. Define Penalty factor. Derive an expression for optimal loading of an n – plant system considering transmission losses. **(10 Marks)**

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

$$\frac{dF_1}{dP_{g_1}} = 0.25P_{g_1} + 40 \quad , \quad \frac{dF_2}{dP_{g_2}} = 0.3P_{g_2} + 30 .$$

Assume that all units are operating at all times and total load varies from 40MW to 300MW. The minimum and maximum loads on each unit are 25MW and 150 MW respectively. Determine i) The most economical division of load between the generators for a load of 250MW ii) The saving in Rs/day obtained compared to equal load sharing between the two units. **(10 Marks)**

6 a. For a two plant power system derive an expression for transmission loss as a function of plant generation. Mention the assumptions made in deriving transmission loss coefficients formula. **(10 Marks)**

b. For the Power System in fig. Q6(b), obtain the loss coefficients and the power loss in transmission. Take plant currents, $I_1 = 1 \angle 0$ pu and $I_2 = 0.8 \angle 0$ pu and voltage at bus – 3 , $V_3 = 1 \angle 0$ pu. Line Impedances in pu are $Z_a = 0.02 + J0.25$, $Z_b = 0.03 + J0.35$. **(10 Marks)**

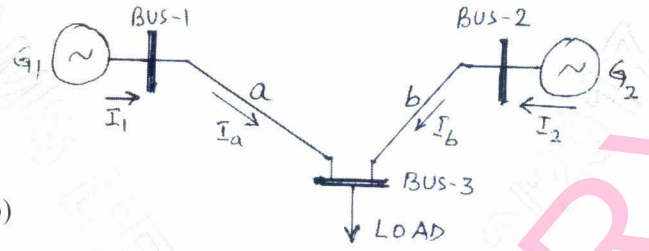

Fig.Q6(b)

7 a. Explain clearly the point – by – point method of solving swing equation. Mention the assumptions made. **(10 Marks)**

b. Under transient conditions, a machine is represented by a constant voltage source behind a transient reactance. Discuss with the help of suitable expressions, how the transient stability studies is obtained using modified Euler's method. **(10 Marks)**

8 a. Describe the methodology of using Runge – Kutta technique for transient stability studies of a power system. **(10 Marks)**

b. Explain Milne Predictor corrector method of soiving swing equation in transient stability studies. **(10 Marks)**

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10EE72

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electrical Power Utilization

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Mention advantages of using electricity as a energy source for heating. **(06 Marks)**

b. Discuss the principle of dielectric heating and obtain expression for dielectric power loss. **(06 Marks)**

c. A resistance oven employing Nichrome wire is to be operated from 230V, 1ϕ supply and rated at 16KW. If the temperature of element is to be limited to 1170°C and average temperature of charge is 500°C. Find diameter and length of heating element wire. Take radiating efficiency as 0.57, emissivity as 0.9, specific resistance of Nichrome = 1.09×10^{-6} Ω-m. **(08 Marks)**

2 a. With neat diagram explain spot welding **(06 Marks)**

b. State and explain Faraday's law of electrolysis. **(06 Marks)**

c. What is electro-deposition? Discuss factors which affect quality of electro deposition. **(08 Marks)**

3 a. Define the following with reference to illumination : i) luminous flux ii) MHCP iii) Coefficient of utilization. **(06 Marks)**

b. Two lamps of 100 cp are mounted on two lamp post 10m apart. the post have different height of 3m and 4m calculate illumination at a point i) midway between the lamp post ii) below the 3m lamp post. **(08 Marks)**

c. Discuss briefly about flood lighting. **(06 Marks)**

4 a. With a neat diagram, explain the construction ad working of high pressure mercury vapour lamp. **(08 Marks)**

b. It is desired to illuminate drawing hall with an average illumination of 200 lux. The hall is of dimension $30 \times 20m^2$. The lamps are fitted 4m from ground. Find number of lamps and watt/lamp. Draw the layout with lamp positions. Take efficiency of lmap = 25 ℓumen/watt, depreciation factor = 0.8, coefficient of utilization = 0.75, space height ratio is to be 0.8 – 1.2. Verify your design. **(08 Marks)**

c. Compare the performance of LED lamp and CFL lamps. **(04 Marks)**

PART – B

5 a. Compare main line service, suburban service, urban service with reference to traction. **(04 Marks)**

b. Considering trapezoidal speed time curve approximation prove that crest speed is given as

$$V_m = \frac{T}{k} - \sqrt{\left(\frac{T}{k}\right)^2 - \frac{7200D}{k}}, \text{ where } k = \frac{1}{\alpha} + \frac{1}{\beta}.$$ **(08 Marks)**

c. An electric train has an average speed of 40 kmph on a level track between stops 1500m apart. It is accelerated at 2 kmphps and is braked at 3 kmphps. Calculate time period of acceleration, free running, braking. Draw the speed time curve assuming trapezoidal curve. **(08 Marks)**

6 a. Derive expression for power output from driving axle. **(06 Marks)**

b. A 250 tonne motor coach has 4 motors each developing a 6000 Newton-mt torque during acceleration starting from rest. If gradient is 40 in 1000, gear ratio = 4, efficiency of gear transmission = 87%, wheel diameter = 80cm, train resistance = 50Nw/Tonne, calculate time taken to attain 50kmph. Allow 12% for additional rotational inertia. If line voltage is 3000V DC and motor efficiency = 85% find current drawn during notching period. **(10 Marks)**

c. Define with reference to traction i) Dead weight ii) Coefficient of adhesion. **(04 Marks)**

7 a. Explain with diagram working principle of linear induction motor. **(06 Marks)**

b. Explain bridge transition control of DC motors. **(06 Marks)**

c. A 400 Tonne electric train has its speed reduced by regenerative braking from 60 to 40 kmph over a distance of 2 km along down gradient of 1.5%. Assuming specific train resistance as 50N/ton, rotational inertia effort = 10%, conversion efficiency of system = 75%. Calculate :

i) Energy returned to the line

ii) Average power returned to tre line. **(08 Marks)**

8 a. Explain the general electric vehicle configuration with relevant block diagram. **(12 Marks)**

b. Explain regenerative braking with reference to DC motors. **(08 Marks)**

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10EE73

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the industrial applications of high voltage? **(05 Marks)**

b. Explain the need of high voltage in the laboratory. **(05 Marks)**

c. With a neat sketch explain the principle and working of electrostatic painting. **(10 Marks)**

2 a. Derive an expression for the current in the air gap $i = i_0 e^{\alpha d}$ considering townsend first ionization coefficient. **(08 Marks)**

b. In an experiment in certain gas it was found that the steady state current is 6×10^{-8}A at 10kV at a gap spacing of 0.4cms between the electrodes keeping the field constant and reducing the gap spacing to 0.2cm a current of 10×10^{-9}A was obtained. Calculate the townsend primary ionization co-efficient of 'λ'. **(06 Marks)**

c. What is meant by time lag of breakdown? Explain statistical and formative time lag. **(06 Marks)**

3 a. What are the limitations of townsend theory and explain the streamer's theory. **(10 Marks)**

b. Briefly explain electro mechanical break down and thermal breakdown in solid insulating materials. **(10 Marks)**

4 a. With the help of a neat sketch, explain how cascade transfer generates high voltage AC. **(06 Marks)**

b. Derive an expression for average ripple and voltage drop of a three stage HVDC circuit. **(08 Marks)**

c. Determine the average ripple and voltage drop of a 4 stage HVDC circuit with a stage capacitance of 4 μF and a load current of 500mA. Supply frequency is 50Hz. **(06 Marks)**

PART – B

5 a. Define the wave front and wave-tail times of an impulse voltage wave. What are the percentage tolerances for a standard lighting impulse wave? **(06 Marks)**

b. With the help of a neat sketch how impulse voltage can be developed in the laboratory by Mar_x circuit. **(08 Marks)**

c. Calculate the front and tail resistance for 5 stages, 1000kV with the capacitance of each stage is 5μF and a load capacitance of 10,000 pF for 1μs front and 50μs tail wave. **(06 Marks)**

6 a. Explain the working principle of generating voltmeter with a figure. **(08 Marks)**

b. A generating voltmeter is required to measure voltage between 15 kV to 250kV. If the indicating meter reads a minimum current of 2μA and a maximum of 35μA, determine the capacitance of the generating voltmeter. The speed of the drive motor is 1500 rpm. **(04 Marks)**

c. Explain the factors that influence the measurement of high voltage using the sphere gap. **(08 Marks)**

7 a. With the help of a diagram of Schering bridge explain how capacitance and $\tan\delta$ can be measured. **(08 Marks)**

b. Explain the transformer ratio arm bridge for audio frequency range measurements. **(06 Marks)**

c. Discuss the factors affecting the discharge detection. **(06 Marks)**

8 a. Explain in detail the testing of circuit breakers. **(10 Marks)**

b. What are the tests on transformer and explain in detail the impulse testing of transformer? **(10 Marks)**

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10EE74

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018

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. Briefly explain the different power modulators that used in drive system. **(06 Marks)**

b. With the help of quadrantal diagram, explain four-quadrant operation of a motor driving a hoist load. **(10 Marks)**

c. Define active load torque and passive torque. Give an example. **(04 Marks)**

2 a. Explain the steady state stability in the drive system. **(05 Marks)**

b. Explain standard classes of motor duty with load diagram. **(08 Marks)**

c. A motor has heating-time constant of 70 min and a cooling time constant of 90 min. When run continuously on full load of 400 kW, final temperature rise is 50°C.

i) When used in short time periodic duty cycle consisting of loaded period of 10 min followed by no-load period long enough for the motor to cool down. What will be the maximum load that motor can carry?

ii) Determine the maximum load the motor can deliver when subjected to intermittent periodic load cycle consisting of a load period of 10 min followed by a no-load period of 15 min. **(07 Marks)**

3 a. Explain the dynamic braking of separately excited DC motor. **(06 Marks)**

b. A 220 V, 200 A, 800 rpm separately excited DC motor has an armature resistance of 0.06 Ω. The motor armature is fed from a variable voltage source with an internal resistance of 0.04 Ω. Calculate internal voltage of the variable voltage source when the motor is operating in regenerative braking at 80% of the rated motor torque and 600 rpm. **(06 Marks)**

c. Explain the operation of continuous conduction mode of a single-phase fully controlled rectifier control of separately excited DC motor. **(08 Marks)**

4 a. A 220 V, 1500 rpm, 10 A separately excited dc motor is fed from a single-phase fully controlled rectifier with an AC source voltage of 230 V, 50 Hz, $R_a = 2\ \Omega$. Conduction can be assumed to be continuous, calculate firing angle for:

i) Half the rated motor torque and 500 rpm

ii) Rated motor torque and −1000 rpm. **(08 Marks)**

b. Explain the multiquadrant operation of a separately excited DC motor using single-phase fully controlled rectifier with a reversing switch. **(06 Marks)**

c. Explain the regenerative braking of separately excited DC motor by chopper control. **(06 Marks)**

PART – B

5 a. What is single phasing? Explain the operation of a 3-phase induction motor with unbalanced voltages. **(07 Marks)**

b. A 2200 V, 50 Hz, 3 phase, 6 pole, Y connected, squirrel cage induction motor has following parameters: $R_s = 0.075\ \Omega$, $R'_r = 0.12\ \Omega$, $X_S = X'_r = 0.5\ \Omega$. The combined inertia of motor and load is 100 kg-mt^2. Calculate time taken and energy dissipated in the motor during starting. **(08 Marks)**

c. Explain the reverse voltage braking (plugging) of an induction motor. **(05 Marks)**

6 a. Explain the available frequency control of an induction motor and mention any two features. **(07 Marks)**

b. Explain the operation of a voltage source inverter fed induction motor drive. **(07 Marks)**

c. Explain the static rotor resistance control. **(06 Marks)**

7 a. Explain pull-in process in synchronous motor operation from fixed frequency supply. **(05 Marks)**

b. Explain the modes of variable frequency control of synchronous motors. **(05 Marks)**

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

8 a. With schematic diagram, explain the paper mill drive. **(10 Marks)**

b. With schematic diagram, explain the cement mill. **(10 Marks)**

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10EE756

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Testing and Commissioning of Electrical Equipment

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Name the various accessories and fitment on power transformer. **(10 Marks)**
b. Explain the principle and application of Buchholz Relay. **(10 Marks)**

2 a. State the important steps in maintenance of power transformer. **(10 Marks)**
b. Explain the test set – up impulse testing of power transformer. **(10 Marks)**

3 a. State the requirement of type – tests and routine test on synchronous machine. **(10 Marks)**
b. What do you mean by cooling? Explain the different types of cooling of turbo – generator. **(10 Marks)**

4 a. Explain the function and principle of brushless excitation system. **(10 Marks)**
b. State and explain the various abnormal conditions in synchronous generator. State respective protections. **(10 Marks)**

PART – B

5 a. Explain the requirement of foundation work for medium and large induction motor. **(10 Marks)**
b. What are the standard specification of induction motor. **(10 Marks)**

6 a. Explain the procedure of drying out of induction motor by different method. **(08 Marks)**
b. Explain the procedure storing a machine at site. **(05 Marks)**
c. State the choice of motor for hazardous area. **(07 Marks)**

7 a. State the causes for vibration in induction motor, explain the harmful effect of vibration, how are vibration measured? **(10 Marks)**
b. Explain the significance of balancing of rotor, how is balancing achieved. **(10 Marks)**

8 a. Explain the specification of high voltage circuit breaker. **(05 Marks)**
b. What are the type of circuit breaker (based on are quenching medium). **(05 Marks)**
c. State the various maintenance of minimum oil circuit breaker. **(10 Marks)**

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10EE761

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
Power System Planning

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Discuss the different planning tool in detail. **(10 Marks)**

b. Describe the structure of power system indicating the power system components and types. **(10 Marks)**

2 a. Explain National action plan goal briefly. **(10 Marks)**

b. What is co-generation? Describe the two technique of co-generation. **(10 Marks)**

3 a. What is the need for private participation in generating planning? How can it improve the power situation in India? **(10 Marks)**

b. Explain the concept of rational tariff in detail. **(10 Marks)**

4 a. Explain the effect of power generation on environment. **(10 Marks)**

b. Write a note on "Greenhouse Effect". **(10 Marks)**

PART – B

5 a. Explain the load management with diagram. **(10 Marks)**

b. Write a note on power system simulator. **(10 Marks)**

6 a. Explain in detail reliability planning. **(10 Marks)**

b. With diagram, explain computerized management. **(10 Marks)**

7 a. Explain the optimization technique for solution, (i) linear programming method (ii) non linear programming method. **(10 Marks)**

b. Explain least cost optimization problem. **(10 Marks)**

8 a. Explain operating and maintenance cost of thermal power plant using least cost optimization technique. **(06 Marks)**

b. What are the constraints observed during optimization process of power system expansion planning? **(08 Marks)**

c. Develop mathematical objectives function of power system expansion planning. **(06 Marks)**

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10EE764

Seventh Semester B.E. Degree Examination, Dec.2017/Jan.2018
VLSI Circuits and Design

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat diagrams explain the operation of enhancement mode nMOS transistor with different V_{ds} voltages. **(06 Marks)**

b. Explain CMOS p-well fabrication process with neat diagrams. **(09 Marks)**

c. Compare CMOS and biopolar technologies. **(05 Marks)**

2 a. Show that pull-up to pull-down ratio for nMOS inverter driven thro' one or more pass transistor is 8:1. **(08 Marks)**

b. Explain Latch-up in CMOS circuits with relevant diagrams and waveforms. **(06 Marks)**

c. Define MOS transistor trans-conductance and output conductance and derive expression for g_m and g_{ds}. **(06 Marks)**

3 a. With relevant diagrams explain Lambda (λ) based design rules as applicable to wires and transistors. **(08 Marks)**

b. Draw the circuit symbol and stick diagrams for CMOS inverter. **(05 Marks)**

c. Draw the stick diagram and layout for nMOS shift register cell. **(07 Marks)**

4 a. What is sheet resistance? Calculate sheet resistance for transistor channel if L = 8λ, w = 2λ and n-channel $R_s = 10^4$ Ω/square. **(04 Marks)**

b. With schematic diagrams explain inverting and non inverting super buffers. **(08 Marks)**

c. Explain three different kinds of wiring capacitances. **(08 Marks)**

PART – B

5 a. Derive scaling factor for any ten device parameters. **(10 Marks)**

b. Discuss the limitation of scaling on interconnect and contact resistance. **(10 Marks)**

6 a. Draw the stick diagram for 2-input CMOS NAND gate. **(05 Marks)**

b. Explain in detail Pseudo- nMOS logic taking inverter as an example. **(07 Marks)**

c. With block diagram and stick diagram explain the design approach of a parity generator. Using nMOS logic. **(08 Marks)**

7 a. Draw and explain combinational circuit to generate two phase clocking. **(06 Marks)**

b. Explain percharge bus concept with relevant diagrams. **(06 Marks)**

c. Explain the operation of 4×4 cross bar switch with neat diagram. **(08 Marks)**

8 a. Explain implementation of ALU functions with an adder using appropriate figures and expressions. **(10 Marks)**

b. Draw the structure of multiplexer based adder logic with stored and buffered sum output and explain. **(10 Marks)**

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