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10EE71

Seventh Semester B.E. Degree Examination, June/July 2018
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Missing data, if any, may suitably be assumed.

PART – A

1 a. With the help of a typical one line diagram, define the basic terms associated with graph theory. **(10 Marks)**

b. For the tree shown in Fig.Q1(b), form the basic cut set matrix B and basic loop incidence matrix C and hence determine C^tB. **(10 Marks)**

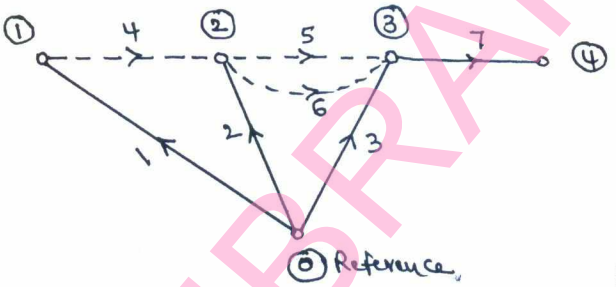

Fig.Q1(b)

2 a. With the usual notations, derive the equation :

$$Y_{BUS} = A^t [y] A.$$ **(06 Marks)**

b. The primitive admittances of the lines are shown in the Fig.Q2(b). Taking ground as reference, form Y_{BUS} by Direct inspection method.

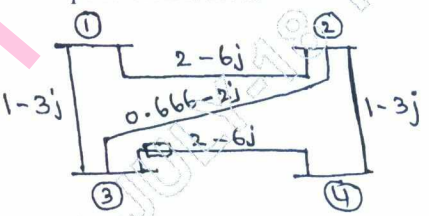

Fig.Q2(b)

Bus ③ has a transformer in the line 3 – 4 with off - nominal turns ratio 1.04. **(06 Marks)**

c. The p.u. impedances of the lines are shown in the Fig.Q2(c). Determine Z_{Bus} by Building Algorithm technique. Take the elements in the order : 0 – 1, 1 – 2, 0 – 2.

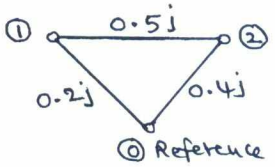

Fig.Q2(c) **(08 Marks)**

3 a. Give the algorithm for GS method of load flow analysis for power system having both PQ and PV buses. **(10 Marks)**

b. The input data for a 3 bus system is as follows:

$$Y_{Bus} = \begin{array}{c|ccc} & ① & ② & ③ \\ ① & -20.834j & 4.167j & 16.667j \\ ② & 4.167j & -9.723j & 5.556j \\ ③ & 16.667j & 5.556j & -22.223j \end{array}$$

Given :

Acceleration factor, $\alpha = 1.4$

Bus	Voltage, p.u.	Net Power, p.u.	
		P	Q
1 (Slack)	1.05 + j0	-	-
2 (PQ bus)	-	– 0.3	– 0.2
3 (PQ bus)	-	– 0.6	– 0.25

Using GS iterative method, find bus voltages and slack bus power at the end of first iteration. **(10 Marks)**

4 a. Draw the flow chart for Newton-Raphson method of Load Flow analysis for power system with PQ buses. **(10 Marks)**

b. For a 3 bus system the following data is given :

$$Y_{Bus} = \begin{array}{c|ccc} & ① & ② & ③ \\ ① & 15\angle -90^\circ & 10\angle 90^\circ & 5\angle 90^\circ \\ ② & 10\angle 90^\circ & 15\angle -90^\circ & 5\angle 90^\circ \\ ③ & 5\angle 90^\circ & 5\angle 90^\circ & 10\angle -90^\circ \end{array}$$

Bus No.	Type	Voltage, p.u.	Net Power	
			P p.u.	Q p.u.
1	Slack	1 + j0	-	-
2	PV bus	1.1 + j0	5.3217	-
3	PQ bus	1 + j0	– 3.6392	– 0.534

Determine the elements of the sub-matrices J_1 & J_4 of the Jacobian matrix J of NR load flow equation : $\begin{bmatrix} \Delta P \\ \Delta Q \end{bmatrix} = [J] \begin{bmatrix} \Delta \delta \\ \Delta |V| \end{bmatrix}$ **(10 Marks)**

PART – B

5 a. With the help of neat figures, explain the performance curves of generating unit. **(12 Marks)**

b. Given $\frac{dC_1}{dP_1} = 0.2P_1 + 40$ Rs/MWhr ; $\frac{dC_2}{dP_2} = 0.25P_2 + 30$ Rs/MWhr .

(i) How is the total load of 150 MW distributed for economic operation? Find λ.

(ii) If the load is shared equally find the net increase in operating cost. **(08 Marks)**

6 a. For the one line diagram shown in Fig.Q6(a) : $I_1 = 1.0\angle 0°$ p.u. ; $I_2 = 0.8\angle 0°$ p.u. If the voltage at Bus 3 is $V_3 = 1.0\angle 0°$ p.u. Find the loss coefficients. Line impedances are : 0.04 + 0.16 j p.u. ; 0.03 + 0.12j p.u. and 0.02 + 0.08j p.u. for sections a, b and c respectively. Also find the total transmission loss using the loss coefficients. **(12 Marks)**

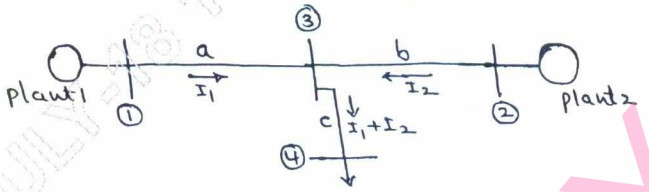

Fig.Q6(a)

b. Write the algorithm for economic load scheduling using iterative method. **(08 Marks)**

7 a. Drive swing equation in terms of machine constant m as well as machine constant H. **(08 Marks)**

b. With the help of diagrams showing the approximations used in the incremental calculations of P_a, ω and δ, give the procedure for first iteration of point by point method. **(12 Marks)**

8 a. Draw the flow-chart for modified Euler's method of solving swing equation. **(12 Marks)**

b. Explain representation of power system for transient stability studies. Give the assumptions made for the same. **(08 Marks)**

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10EE72

Seventh Semester B.E. Degree Examination, June/July 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. Discuss the AJAX WYATT furnace with a neat diagram. Also mention the advantages. **(08 Marks)**

b. Explain the properties of good heating element. **(04 Marks)**

c. Calculate the time taken to melt 4 ton of steel in a 3ϕ Arc furnace, with a current of 5000A, specific heat of steel 0.12 kcal/kg/°C, Arc voltage = 60 V, latent heat of steel = 8.89 kcal/kg Melting point of steel = 1370°C, Initial temperature = 18°C , Resistance and reactance of transformer is 0.003 Ω and 0.005 Ω respectively. Assume overall efficiency of 55%. **(08 Marks)**

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

b. Explain the copper refining process with a neat sketch. **(06 Marks)**

c. A copper refining plant using 500 electrolytic cells carries a current of 6000A, voltage per cell being 0.25 V. If the plant were to work 40 hr/week, calculate the energy consumption per ton. Assuming ECE of copper as 0.3281 mg/columb of electricity. **(08 Marks)**

3 a. What is photometer? Explain it with a neat sketch. **(06 Marks)**

b. State and explain the laws of illumination. **(08 Marks)**

c. A workshop measuring 15m × 40m is illuminated by 24 lamps of 500 W each. The luminous efficiency of each lamp is 15 lumen/watt. Assuming a depreciation factor of 0.7 and the coefficient of utilization of 0.5. Determine the illumination on the workshop. **(06 Marks)**

4 a. What are the factors to be considered in the design of lighting scheme? **(06 Marks)**

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

c. In a street lighting scheme 2 lamps of 500 W with a lamp efficiency of 25 lumen/watt are mounted on 2 lamp posts 10 m apart. The lamp posts are at an height of 3 m and 4 m. Calculate the illumination on the ground at a point midway between the posts. **(08 Marks)**

PART – B

5 a. Derive an equation for the actual distance travelled between 2 stations using the quadrilateral speed time curve. **(08 Marks)**

b. Discuss the requirement of an ideal traction system. **(05 Marks)**

c. An electric train has a schedule speed of 30 kmph between stations 1 km apart. The duration of stop is 20 sec. The crest speed is 25% higher than average running speed, braking retardation is 3 kmphps. Calculate the acceleration required to run the service, considering the trapezoidal speed time curve. **(07 Marks)**

6 a. Derive an expression for the specific energy output on a level track using simplified trapezoidal speed time curve. **(10 Marks)**

b. A 220T motor each has 4 motor each developing 7500 N-m torque during acceleration starts from rest. If the gradient is 25 in 1000, gear ratio 3.2, gear transmission efficiency 90%, wheel radius of 46 cm, train resistance 45 N/T and additional rotational inertia of 8%. Calculate (i) the time taken to attain speed of 72 kmph. (ii) If the line voltage is 3000 V and efficiency of motor is 87%. Find the current during notching period. **(10 Marks)**

7 a. Derive an expression of tractive effort for the propulsion of train. **(08 Marks)**

b. A 320T electric train runs up an ascending gradient of 1.2% with the following data:
(i) Acceleration of 2 kmphps for 20 sec.
(ii) Constant speed for 45 sec
(iii) Coasting for 25 sec.
(iv) Braking at 2.645 kmphps.
Calculate the specific energy consumption of the train if the train resistance is 45 N/T. Effect of rotational inertia is 8% and overall efficiency of transmission gear is 78%. **(12 Marks)**

8 Write short notes on any four:
a. Hybrid vehicles
b. Train lighting system
c. DC series motor for traction service
d. Series parallel control used for DC motor
e. Linear Induction motors. **(20 Marks)**

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10EE73

Seventh Semester B.E. Degree Examination, June/July 2018
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the need for generating high voltages in the laboratory. **(05 Marks)**

b. Mention the industrial applications of high voltage. **(05 Marks)**

c. With the help of necessary sketches, explain the operation of pipe-type electrostatic precipitator. **(10 Marks)**

2 a. Define Townsend's first and second ionization coefficients. Derive an expression for the current growth in a gas discharge due to secondary mechanism. **(10 Marks)**

b. With the help of necessary equations and curve, state and explain Paschen's law. **(05 Marks)**

c. A steady current of 600 μA flows through the plane electrode separated by a distance of 0.5 cm when a voltage of 10 KV is applied. Determine the Townsend's first ionization coefficient if a current of 60 μA flows when the distance of separation is reduced to 0.1 cm, and the field is kept constant at the previous value. **(05 Marks)**

3 a. Explain the mechanism of thermal breakdown in solids. **(08 Marks)**

b. Explain the mechanism of bubble theory in liquids. **(07 Marks)**

c. What is time lag? Describe its components and the factors which affect these components. **(05 Marks)**

4 a. Explain the principle of operation of resonant transformer for producing high voltages. Mention its advantages over the cascade connected transformers. **(10 Marks)**

b. Why a Cockcroft – Walton circuit is preferred for voltage multiplier circuit? Explain its working with three stage schematic diagram. **(10 Marks)**

PART – B

5 a. Define the front and tail time of an impulse voltage wave. What are its tolerances allowed as per the specifications? **(04 Marks)**

b. With the help of neat diagram, explain the construction and working principle of a multistage Marx Impulse generator. **(10 Marks)**

c. An impulse current generator has total capacitance of 15 μF, the charging voltage 125 KV, the circuit inductance 2 mH and the dynamic resistance 1 ohm. Determine the peak current and wave shape of the wave. **(06 Marks)**

6 a. Describe method of measurement of HVAC voltages by chubb and fortescue method. What are the errors that can be present in measurement? **(10 Marks)**

b. Explain the factors influencing the spartover voltage of sphere gaps. **(10 Marks)**

7 a. With the help of a neat sketch, explain construction and principle of operation of HV schering bridge for measurement of capacitance and loss angle. **(10 Marks)**

b. What are partial discharges? Describe the balanced detection schemes for locating partial discharges in electrical equipment. **(10 Marks)**

8 a. A Rogowski coil is to be designed to measure impulse currents of 10 KA having a rate of change of current of 10^{11} A/S. The current is read by a TVM as a potential drop across the integrating circuit connected to the secondary. Estimate the values of mutual inductance, resistance and capacitance to be connected, if the meter reading is to be 10 V for full-scale deflection. **(08 Marks)**

b. Write briefly about testing of, (i) Insulators. (ii) Cables. **(12 Marks)**

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10EE74

Seventh Semester B.E. Degree Examination, June/July 2018
Industrial Drives & 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. With a neat block diagram, explain the various components of an electrical drive. **(06 Marks)**

b. Explain how load equalization is done in an electrical drive with necessary diagrams. **(06 Marks)**

c. A motor drives two loads, one load has rotational motion and the other has translational motion. M.I. of the motor is 1.2 kg-m^2. Motor runs at 1000 rpm. The first load is rotational at 200 rpm speed. Load inertia is 7 kg-m^2 at a torque of 10 N-m. The second load having translational motion has a speed of 10 m/sec driving a mass of 10 kg with a force of 20 N. Calculate equivalent inertia of system referred to motor shaft and power rating of motor. Assume negligible loss in the transmission system. **(08 Marks)**

2 a. Explain different methods of determining the rating of a motor with fluctuating load. **(08 Marks)**

b. Derive an equation for the overloading factor under short time duty cycle. **(06 Marks)**

c. A 60 KW motor runs for 40 min. Heating time constant of motor is 80 minutes. The maximum efficiency occurs at 80% of full load. Determine continuous rating of motor. **(06 Marks)**

3 a. Explain dynamic braking of separately excited d.c. motors and series with necessary diagrams. **(08 Marks)**

b. Explain the speed control of a separately excited d.c. motor using single phase half controlled rectifier. **(06 Marks)**

c. A 220 volts, 970 rpm, 100 Amp separately excited d.c. motor has armature resistance of 0.05 ohm. It is braked by plugging from a speed of 1000 rpm. Calculate (i) Resistance value in armature circuit to limit braking current to twice the full load current (ii) Braking torque (iii) Torque when speed is zero. **(06 Marks)**

4 a. Explain the chopper control a separately excited d.c.motor. **(08 Marks)**

b. Describe separately excited dc motor control using 3 phase fully controlled rectifier. **(06 Marks)**

c. A 230 volts, 960 rpm, 200 amp, separately excited d.c. motor has an armature resistance of 0.02 ohm. The motor is connected to a chopper. The source voltage is 230 volts. Assuming continuous condition (i) Calculate duty ratio of chopper for motoring operation at rated torque and 350 rpm (ii) Calculate duty ratio for braking operation at rated torque and 350 rpm. **(06 Marks)**

PART – B

5 a. Explain the d.c. dynamic braking of 3 phase induction motor. **(08 Marks)**

b. Explain the operation of 3 phase induction motor supplied from non-sinusoidal voltage supply. **(06 Marks)**

c. A 400 volts, star connected 3 phase, 6 pole, 50 Hz induction motor has following parameters referred to stator. $R_s = R'_r = 1$ ohm, $X_s = X'_r = 2$ ohm. For regenerative braking operation, calculate the overhauling torque and range of speed operation. **(06 Marks)**

6 a. With necessary diagrams, explain the variable frequency control of induction motor. **(08 Marks)**

b. Explain the static rotor resistance control of induction motor. **(06 Marks)**

c. Explain the static Scherbius drive. **(06 Marks)**

7 a. Explain the operation of synchronous motor from fixed frequency supply. **(07 Marks)**

b. Explain the variable frequency control of synchronous motor. **(06 Marks)**

c. Explain the self controlled synchronous motor drive using load commutated thyristor inverter. **(07 Marks)**

8 a. Name and explain the different drives used in cement mill. **(10 Marks)**

b. Explain the various stages in paper mill and motors used in various stages. **(10 Marks)**

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10EE756

Seventh Semester B.E. Degree Examination, June/July 2018
Testing and Commissioning of Electrical Equipments

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Mention the specification of power transformers and give typical rating plate details. **(05 Marks)**

b. Explain the civil work associated with transformer foundation. **(05 Marks)**

c. State the various commissioning tests on power transformer. **(10 Marks)**

2 a. Which are the 4-phasor groups adopted for standard connection of transformer? Explain anyone, with phasor dia. and winding connection. **(10 Marks)**

b. What are the different methods of drying out transformer? Explain. Also draw the typical dryout curves of the transformer. **(10 Marks)**

3 a. What are the various specifications of synchronous machines? **(05 Marks)**

b. Explain the sudden 3-phase short circuit test on a 3-phase synchronous generators. How to calculate $X_{d'}$, $X_{d''}$ and X_d from the sudden 3-phase short circuit test? **(10 Marks)**

c. Describe the method of measuring field resistance and armature resistance of synchronous machine. **(05 Marks)**

4 a. Explain the steps involved in conducting slip test? How do you calculate the reactances? **(10 Marks)**

b. Define Short Circuit Ratio (SCR) of a synchronous machine. What is its significance? Explain the procedure to determine it. **(04 Marks)**

c. Explain the suitability of hydrogen as coolant used in turbo alternators. **(06 Marks)**

PART – B

5 a. Explain how high voltage test on rotating machines are conducted. **(07 Marks)**

b. Explain the vibration test conducted on an induction motor. **(03 Marks)**

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

6 a. Explain the load test on 3-ϕ Induction motor. **(05 Marks)**

b. Explain the various type tests and routine tests conducted on an induction machine. **(10 Marks)**

c. Explain the derating of induction motors. **(05 Marks)**

7 a. Explain the various methods of measuring the slip of induction motors. **(10 Marks)**

b. What is static and dynamic balancing of shaft of induction motors? **(10 Marks)**

8 a. State the typical specifications of high voltage circuit breaker. **(10 Marks)**

b. What are the factors to be considered while selecting a circuit breaker? Explain. **(06 Marks)**

c. What are the different type tests conducted on circuit breakers? Explain. **(04 Marks)**

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10EE761

Seventh Semester B.E. Degree Examination, June/July 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. Briefly explain the points to be explored for power system planning. **(08 Marks)**
b. Write a note on Detailed Project Report. **(06 Marks)**
c. Discuss in brief the Indian Electricity Rules 1956. **(06 Marks)**

2 a. Briefly explain the desirable options for national action plan. **(10 Marks)**
b. Define power pooling and mention its advantages and constraints. **(07 Marks)**
c. What do you understand by power trading? Briefly explain. **(03 Marks)**

3 a. What are the components of rural electrification planning? Briefly explain. **(08 Marks)**
b. Explain the broad options available for funding by various financial institutions. **(12 Marks)**

4 a. Define algorithm used in computer aided planning. **(02 Marks)**
b. Briefly explain the important features of algorithm. **(06 Marks)**
c. What is green house effect? And explain how green houses work. **(04 Marks)**
d. What are the green house gases? Briefly explain. **(08 Marks)**

PART – B

5 a. Explain the concept of load prediction using regression analysis. **(10 Marks)**
b. Explain the important aspects of online power flow studies. **(10 Marks)**

6 a. Write a note on computerized management. **(08 Marks)**
b. Define and explain with schematic diagram the power system simulator. **(12 Marks)**

7 a. Develop an IGA (Improved Generic Algorithm) and its application to least cost generation expansion planning. **(12 Marks)**
b. What are the constraints observed during optimization process of power system expansion planning? **(08 Marks)**

8 a. Explain the generation expansion planning strategies on power system. **(12 Marks)**
b. Write note on optimization techniques. **(08 Marks)**

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10EE764

Seventh Semester B.E. Degree Examination, June/July 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. Explain in detail, the process of n-MOS fabrication with the help of necessary fabrication structures. **(10 Marks)**

b. Discuss Moore's law. Explain the working of enhancement mode of transistor with different values of V_{ds}. **(10 Marks)**

2 a. Derive an expression for I_{ds} for both saturated as well as non saturated region. **(10 Marks)**

b. Define Zpu / Zpd. Show that pull up to pull down ratio for nMOS inverter driven through one or more pass transistor is 8 : 1. **(10 Marks)**

3 a. Draw the monochrome stick diagram of n-MOS shift register cell. **(06 Marks)**

b. Define stick diagram. Explain the encoding used for simple n-MOS process. **(06 Marks)**

c. What are the advantages of complementary transistor pull-up for an inverter? With relevant diagram, explain the CMOS inverter operation in different region. **(08 Marks)**

4 a. Define sheet resistance, square capacitance and delay unit, explain it same for different technologies. **(06 Marks)**

b. Estimate CMOS inverter delay interms of rise time and fall time. **(06 Marks)**

c. Calculate the total capacitance in picofarads between the substrate and structure as shown in Fig. Q4 (c) for Lambda = 5 μm. Use standard values. **(08 Marks)**

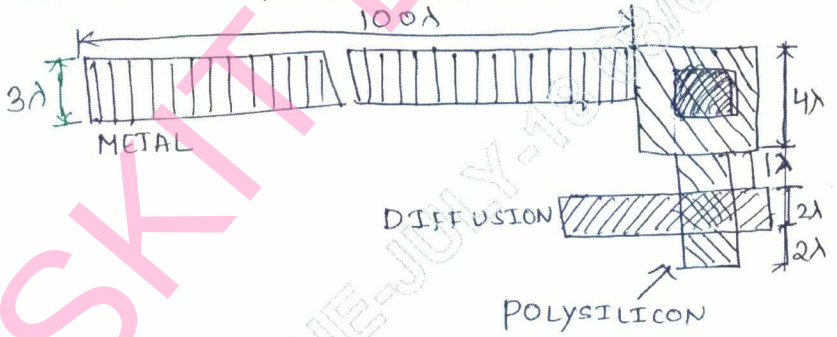

Fig. Q4 (c)

PART – B

5 a. Derive the scaling factors for the following device parameter by considering constant electric field scaling model:

(i) Gate capacitance
(ii) Maximum operating frequency
(iii) Current density.
(iv) Channel resistance.
(v) Power dissipation per gate P_g. **(10 Marks)**

b. Discuss in detail the limitation of scaling and limits due to subthreshold currents. **(10 Marks)**

6 a. Write the structure and stick diagram of nMOS, CMOS 2 I/P nand gates. **(06 Marks)**

b. Prove that for pseudo nMOS logic $Zpu / Zpd = \frac{3}{1}$. **(06 Marks)**

c. Write note on:
   (i) General logic function block.
   (ii) Multiplexer. **(08 Marks)**

7 a. Explain the design of 4-bit shifter. **(10 Marks)**

b. Define regularity. Explain the design of an ALU subsystem. **(10 Marks)**

8 Write short notes on:
a. Some general consideration in subsystem design processes.
b. Dynamic shift register.
c. Dynamic CMOS logic.
d. Gray code to binary code converter. **(20 Marks)**

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