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06EE71

Seventh Semester B.E. Degree Examination, December 2012
Computer Techniques in Power System Analysis

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 sketches, explain the following: i) Oriented graph ii) Tree iii) Singular matrix. **(06 Marks)**

b. Explain briefly the primitive network used in the formation of bus admittance matrix by singular transformation. **(04 Marks)**

c. For the system defined by the line data shown in Fig. Q1 (c), determine the bus admittance matrix by singular transformation. Select bus ⑥ as the reference and a tree with elements 6 and 7 as links. **(10 Marks)**

Line data:

Line No.	1	2	3	4	5	6	7
Bus code p – q	1 – 6	2 – 6	2 – 5	1 – 3	3 – 4	4 – 5	3 – 6
Admittance in per unit	j20	j35	j10	j5	j20	j10	j25

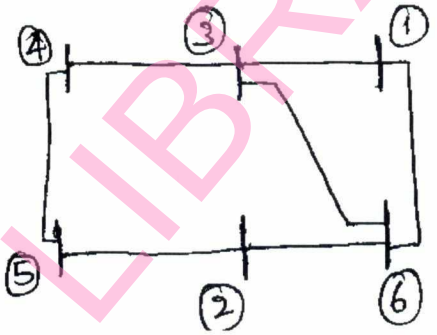

Fig. Q1 (c)

2 a. Derive an expression for formation of bus admittance matrix (Y_{BUS}) by singular transformation? **(08 Marks)**

b. Derive the algorithm for formation of bus impedance matrix (Z_{BUS}) for single phase system when a link element is added to the partial network? **(12 Marks)**

3 a. What is load flow analysis? Explain how the buses are classified to carryout the load flow analysis in power systems? **(06 Marks)**

b. Write a note on the advantages of bus admittance matrix in a load flow analysis? **(04 Marks)**

c. Explain the load flow solution procedure of Gauss siedel iterative method for a power system having both P-V and P-Q buses. Also explain how acceleration factors are applied at the end of each iteration. **(10 Marks)**

4 a. What are the assumptions made in fast decoupled load flow method? Where does this method find its applications? **(06 Marks)**

4 b. For the sample power system networks shown in Fig. Q4 (b), determine the bus voltages at the end of first iteration using Gauss siedel method. Assume flat voltage start. **(14 Marks)**

Line data table

Line from bus to bus	R in Pv	X in Pv
1 – 2	0.05	0.15
1 – 3	0.10	0.30
2 – 3	0.15	0.45
2 – 4	0.10	0.30
3 – 4	0.05	0.15

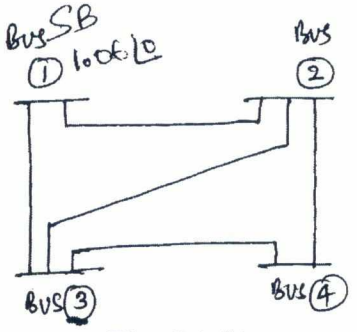

Fig. Q4 (b)

PART – B

5 a. Explain the method of equal incremental costs for the economic operation of generators with the transmission loss considered? **(06 Marks)**

b. What are B-coefficients? Obtain the expression for the transmission loss coefficients for a 3-bus system? **(06 Marks)**

c. Two units 1 and 2 each of 200 MW, supply a constant load of 300 MW. The fuel costs are as follows with P_G in MW and the cost in Rs./hr $I_{C_1} = 0.1PG_1 + 20$, $I_{C_2} = 0.12PG_2 + 15$. Determine the most economical division of load between the two units. Arrive at the saving per day realized as compared to equal sharing of the total load between the two units. **(08 Marks)**

6 a. Explain the mathematical formulation and solution procedure of optimal scheduling for hydrothermal plants. **(10 Marks)**

b. Two bus system is shown in Fig. Q6 (b). If 100 MW is transmitted from plant 1 to the load, a transmission loss of 10 MW is incurred. Find the required generation for each plant and the power received by load when the system x is Rs.25/MWh. The incremental fuel costs of two plants are given below:

$$\frac{dC_1}{dP_{G_1}} = 0.02PG_1 + 16.0 \text{ Rs/MWh}, \quad \frac{dC_2}{dP_{G_2}} = 0.04PG_2 + 20.0 \text{ Rs/MWh}$$ **(10 Marks)**

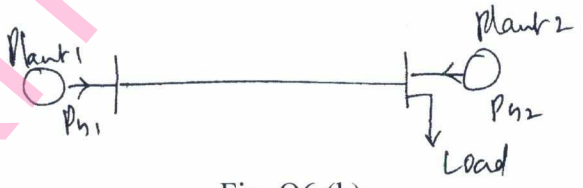

Fig. Q6 (b)

7 a. With necessary equations and flow chart describe the solution of swing equations using modified Eulers method in a multi-machine stability analysis. **(10 Marks)**

b. With the help of a flow diagram, explain the method of finding the transient stability of a given power system based on Runge-Kutta method. **(10 Marks)**

8 a. Explain i) Network performance equation.
ii) Load models employed in multimachine stability studies. **(10 Marks)**

b. Explain with the necessary equations the solution of swing equation by point by point method? How discontinuities are handled? **(10 Marks)**

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06EE72

Seventh Semester B.E. Degree Examination, December 2012
Electrical Power Utilization

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Give a classification of different electric heating methods and explain them briefly. **(08 Marks)**

b. Explain the metal arc welding process. **(04 Marks)**

c. Determine the diameter and length of nichrome wire to be used as heating element in a 10 kW 220 V single phase resistance furnace. The temperature of wire should not exceed 1000°C and the charge is to be at temperature of 500°C. Assume radiating efficiency as 0.7 and the emissivity of the element as 0.9. The resistivity of nichrome is 1.016×10^{-6} ohm-metre. **(08 Marks)**

2 a. Define and explain briefly the following terms referred to electrolytic processes:
i) Electro-chemical equivalent ii) Current efficiency
iii) Energy efficiency. **(06 Marks)**

b. Explain the following processes:
i) Extraction of metals.
ii) Anodizing. **(08 Marks)**

c. Nickel coating of 1 mm thickness is to be built on a cylindrical surface 15 cms diameter and 20 cm long in 1½ hours. Calculate the electrical energy needed if ECE of nickel is 0.3043 mgm/coulomb. Specific gravity 8.9 and voltage used in electroplating is 10 volts. **(06 Marks)**

3 a. State and explain the inverse square law of illumination. **(08 Marks)**

b. A 500 W lamp having MSCP of 800 is suspended 3 m above the working plane. Determine
i) Illumination directly below the lamp at working plane ii) Lamp efficiency
iii) Illumination at a point 2.4 m away on the horizontal plane from vertically below the lamp. **(06 Marks)**

c. Explain the light flux method of calculation of light, considering relevant factors. Mention its application and advantage. **(06 Marks)**

4 a. Explain the principles which are adapted in street-lighting. **(08 Marks)**

b. With a neat figure, explain the construction and working of a sodium vapour lamp. **(07 Marks)**

c. Two lamp posts are 16 m apart and are fitted with 500 CP lamp each at a height of 6 m above the ground. Calculate
i) illumination mid-way between the posts.
ii) illumination under each lamp. **(05 Marks)**

PART – B

5 a. Define the following, referred to traction system: i) Schedule speed ii) Average speed iii) Crest speed **(04 Marks)**

b. With usual notations, show that $V_m = \frac{T}{K} - \sqrt{\left(\frac{T}{K}\right)^2 - \frac{7200D}{K}}$ where $K = \left(\frac{1}{\alpha} + \frac{1}{\beta}\right)$. **(10 Marks)**

c. An electric train has a maximum speed of 70 kmph. The schedule speed and stop at station are 45 kmph and 30 seconds respectively. If the acceleration is 1.5 kmphps, find the value of retardation when the distance between stops is 4 km. **(06 Marks)**

6 a. Define specific energy consumption of a train. Derive an expression for specific energy consumption. **(12 Marks)**

b. A 250 tonne motor coach having 4 motors each developing 5000 N-m torque during acceleration starts from rest. If up-gradient is 25 in 1000, gear ratio 5, gear transmission efficiency 88% wheel radius 44 cm, train resistance 50 N/tonne rotational inertia weight is 10%, calculate the time taken to reach a speed of 45 kmph. **(08 Marks)**

7 a. With relevant figures, explain the steps involved in bridge transition method of series-parallel starting of two DC series motors. **(06 Marks)**

b. With a neat figure, explain the construction and working of a single phase AC series motor. **(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 a down-gradient of 1.5%. Assuming specific train resistance as 50 N/tonne, rotational inertia effect 10% and conversion efficiency of the system 75%, calculate

i) Electrical energy returned to the line.

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

8 a. Briefly explain different systems of railway electrification. **(10 Marks)**

b. With a block diagram, explain the functions of different subsystems in an electric vehicle. **(10 Marks)**

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06EE73

Seventh Semester B.E. Degree Examination, December 2012

High Voltage Engineering

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the effect of high voltage used in transmission on:
   i) Volume of copper required
   ii) Line efficiency
   iii) Line voltage drop **(10 Marks)**

   b. Define Townsends first and second ionization coefficients. How is the condition for breakdown obtained in a Townsend discharge? **(10 Marks)**

2 a. Explain the various theories that explain breakdown in commercial liquid dielectrics. **(10 Marks)**

   b. Explain the following breakdown mechanism in solid:
   i) Streamer breakdown
   ii) Electromechanical breakdown **(10 Marks)**

3 a. Explain with a neat figure the cascade transformer unit with isolating transformers for excitation for producing very high a.c. voltage. **(10 Marks)**

   b. Write short notes on:
   i) Resonant transformer
   ii) Tesla coil **(10 Marks)**

4 a. Why is a Cockcroft-Wolton circuit preferred for voltage multiplier circuits? Explain its working with a schematic diagram. **(10 Marks)**

   b. A Cockcroft-Wolton type voltage multiplier has eight shapes with capacitances, all equal to 0.05 μF. the supply transformer secondary voltage is 125 KV at a frequency of 150 Hz. If the load current to be supplied is 5 mA. Find:
   i) The percentage ripple
   ii) The regulation
   iii) The optimum number of stages for minimum regulation or voltage drop. **(10 Marks)**

PART – B

5 a. Explain the Marx circuit arrangement for multistage impulse generator. How is the basic arrangement modified to accommodate the wave time control resistance? **(10 Marks)**

   b. Explain with a neat circuit diagram, the tripping of an impulse generator with a three electrode gap method. **(10 Marks)**

6 a. Explain the principle and construction of an electrostatic voltmeter for the measurement of high voltages. What are its merits and demerits? **(10 Marks)**

   b. Write a brief note on capacitance voltage divider. **(05 Marks)**

6 c. A generating voltmeter has be designed so that it can have a range from 20 to 200 KV d.c. If the indicating meter reads a minimum current of 2 μA and maximum current of 25 μA, what should be the capacitance of the generating voltmeter? **(05 Marks)**

7 a. Explain how a sphere gap can be used to measure the peak value of voltages. What are the factors that influence the measurement of such voltages? **(10 Marks)**

b. Write short notes on:

i) Mixed RC potential divider

ii) Rogowski-Coil for high impulse current measurements. **(10 Marks)**

8 a. Discuss the method of straight detection for locating partial discharges in electrical equipment. Show the partial discharge pattern. **(10 Marks)**

b. Explain with a neat schematic diagram, the synthetic testing of circuit breakers. Show the current and recovery voltage waveforms across the test C.B. **(10 Marks)**

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06EE74

Seventh Semester B.E. Degree Examination, December 2012
Industrial Drives and Applications

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 different power modulators that are used in drive system. **(06 Marks)**

b. Describe the steady state stability in the drive system. Derive the required condition for stability. **(10 Marks)**

c. What are the advantages of an electric drive system? **(04 Marks)**

2 a. A motor drives two loads. The rotational load coupled to the motor through reduction gear with a = 0.1 and efficiency of 90%. The load has a moment of inertia of 10 kg-m^2 and a torque of 10 N-m. Other load has a translational motion and consist of 1000 kg weight to be lifted up at a uniform speed of 1.5 m/sec. the coupling between this load and motor has an efficiency of 85%. Motor has an inertia of 0.2 kg-m^2 and runs at a constant speed of 1420 rpm. Determine equivalent inertia and torque referred to the motor shaft and power developed by the motor. **(10 Marks)**

b. A motor operates on a periodic duty cycle consisting of loaded period of 20 mins and no load period of 10 mins. The maximum temperature rise is 60°C heating and cooling time constants are 50 and 70 mins respectively. When operating continuously on no load the temperature rise is 10°C. Determine

i) Minimum temperature during the duty cycle.

ii) Temperature when the motor loaded continuously. **(10 Marks)**

3 a. Explain single phase fully controlled rectifier control of dc-separately excited motor with continuous and discontinuous conduction. **(10 Marks)**

b. A 220 V, 970 rpm, 100 A dc separately excited motor has an armature resistance of 0.05 Ω. It is braked by plugging from an initial speed of 1000 rpm. Calculate

i) Resistance to be placed in armature circuit to limit braking current to twice the full load value.

ii) Braking torque.

iii) Torque when the speed has fallen to zero. **(10 Marks)**

4 a. Describe the 3 phase fully controlled rectifier control of dc separately excited motor. **(10 Marks)**

b. Explain chopper control of separately excited motor for motoring, regenerative and braking operation. **(10 Marks)**

PART – B

5 a. Describe the operation of 3-phase induction motor operating with unbalanced source voltage and single phasing. **(10 Marks)**

b. A 400 V, star connected, 3 phase, 6 pole, 50 Hz induction motor has following parameters referred to the stator $R_s = R_r' = 1\Omega$, $X_s = X_r' = 2\Omega$:

i) For regenerative braking operation determine maximum overhauling torque and range of speed for safe operation.

ii) For plugging operation calculate initial braking current. **(10 Marks)**

6 a. Explain the variable frequency control of induction motor from voltage source. **(10 Marks)**

b. Describe the current source inverter control of induction motors. **(10 Marks)**

7 a. Describe the operation of synchronous motor from fixed frequency supply. **(10 Marks)**

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

c. Explain variable frequency control of multiple synchronous motors. **(04 Marks)**

8 a. Describe self controlled synchronous motor drive employing load commutated thyristor inverter. **(10 Marks)**

b. Classify and explain briefly the drives used in cement industry. **(10 Marks)**

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06EE753

Seventh Semester B.E. Degree Examination, January 2013
Testing & Commissioning of Electrical Equipments

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What is the code of practice for rating and terminal plates of transformer? Draw the sketch of a typical rating plate. **(10 Marks)**

b. State any ten desired characteristics of transformer oil. **(05 Marks)**

c. With the help of a neat circuit schematic describe the phasor group Dyll. **(05 Marks)**

2 a. With the help of suitable sketch explain drying out curves of typical medium sized transformer. **(05 Marks)**

b. What is polarization index? Explain the procedure of calculating polarization index. What is the significance of polarization index? **(10 Marks)**

c. Describe in brief the setup for impulse voltage test on transformers. **(05 Marks)**

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

b. Write a brief note on 'Foundation details of rotating machines'. **(10 Marks)**

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

4 a. Describe the sudden three phase short circuit test on synchronous generator. Draw the oscillogram of current and the method to calculate the various reactances. **(10 Marks)**

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

PART – B

5 a. What are the various parameters mentioned in a typical rating plate of induction motor? **(10 Marks)**

b. Write briefly on 'Shimming work and shaft alignment during installation' of induction motors. **(10 Marks)**

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

b. What are the various reasons for vibrations in induction motors? How are the vibrations measured and what are the permissible vibration limits? **(10 Marks)**

7 a. Explain the various methods used to measure slip of an induction motor? **(10 Marks)**

b. Describe the methods used for starting the induction motor? What are the particular applications of these starting methods? **(10 Marks)**

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

b. Describe in brief type and routine tests carried out on current transformers. **(10 Marks)**

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06EE763

Seventh Semester B.E. Degree Examination, January 2013
Energy Auditing and Demand Side Management

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 classification of energy sources giving examples for each. **(08 Marks)**

b. Explain energy saving using 3- pronged method. **(08 Marks)**

c. Mention highlights of electricity Act 2003. **(04 Marks)**

2 a. What is depreciation? What are the causes for depreciation? **(06 Marks)**

b. An electric motor consumers 40000 kwhr per year. By upgrading to high efficiency parts a saving of 15% can be realized in the energy cost. The additional cost for upgradation is Rs.75000/-. Assume energy cost of Rs.5 per unit. Justify whether the upgradation is economical. Take minimum rate of return interest 20% and life of motor as 15 years. Use present-worth method. **(06 Marks)**

c. Develop a uniform series compound amount cash flow model and obtain expression, for future value (F) for a series of amount A paid for n-years. **(08 Marks)**

3 a. Explain the need for energy audit. **(04 Marks)**

b. Explain clearly mentioning outcome of preliminary audit and detailed audit. **(08 Marks)**

c. What are the various measurements and instruments used in energy audit? **(08 Marks)**

4 a. Draw and explain the power triangle. A 3ϕ, 415V, 50hz supply is connected to a star connected load with impedance per phase as (10 + j20) Ω. Determine various power components. **(08 Marks)**

b. Define the terms plant energy performance and production factor. **(06 Marks)**

c. What is simple pay back period? Mention its advantages and disadvantages. **(06 Marks)**

PART – B

5 a. With necessary vector diagram, Obtain the expression for most economical power factor with constant active load. **(08 Marks)**

b. A load of 500kW at 0.8pf lag is taken by an industrial consumer. The tariff plan is Rs.400/kVA of maximum demand per annum plus Rs.1.00 per unit of energy consumed. The cost of capacitor bank installation is Rs.600/kVAR and annual interest is 11%. Determine:

i) Most economical power factor.

ii) kVAR rating of capacitor bank to improve pf for value in (i).

iii) Saving in kVA rating. **(06 Marks)**

c. Discuss about the location of power factor improvement capacitor. **(06 Marks)**

6 a. What are the objectives of a good tariff plan? **(08 Marks)**

b. Mention the various good practices in lighting system leading to energy conservation. **(06 Marks)**

c. A supply is offered on basis of fixed charge of Rs.30 + Rs.1.5 per unit. Alternately, tariff plan is offered as Rs.1.25/unit for 1st 400 units and Rs.1.8/unit for all additional units. Find the number of units at which both the tariff plans are equal. **(06 Marks)**

7 a. What is demand side management? Mention its benefits. **(10 Marks)**

b. Explain various options of load management as a demand side management strategy. **(10 Marks)**

8 a. Explain various implementation issues with demand side management. **(10 Marks)**

b. Explain plant level organization for DSM implementation. **(06 Marks)**

c. Explain what do you understand by time-of-day tariff. **(04 Marks)**

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