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06EE71

Seventh Semester B.E. Degree Examination, June/July 2013
Computer Techniques in Power System Analysis

Time: 3 hrs. Max. Marks:100

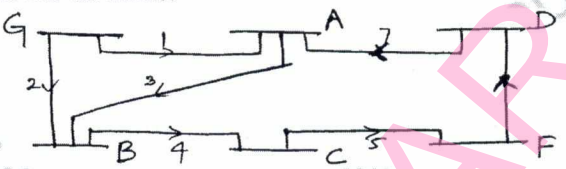
Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is primitive network? Explain its significance. **(06 Marks)**

b. For the Sample power system shown in Fig.Q.1(b) obtain A, B and C matrices. Assume G as reference bus and AB and DF as links. **(06 Marks)**

Fig.Q.1(b)



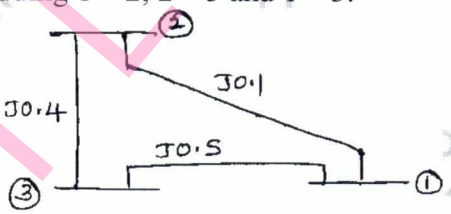
c. Determine Y_{bus} by singular transformation for the system with data as below **(08 Marks)**

Element No.	1	2	3	4	5
Bus code p-q	0 – 1	0 – 2	2 – 3	3 – 0	2 – 0
Self admittance P.U	1.4	1.6	2.4	2.0	1.8

2 a. Derive the generalized algorithm for finding the elements of bus impedance matrix when a branch is added to the partial network. **(10 Marks)**

b. For the system shown in Fig.Q.2(b) with bus 1 as reference and line data impedance as shown compute the Z_{bus} by adding 1 – 2, 2 – 3 and 1 – 3. **(07 Marks)**

Fig.Q.2(b)



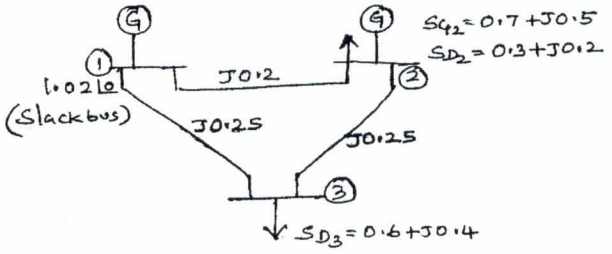
c. Discuss the procedural steps need to
i) Remove an element ① - ③ and
ii) Modify the value of element ② - ③ to j0.9 in the Q.2(b). **(03 Marks)**

3 a. Discuss the bus classification for load flow. **(04 Marks)**

b. Explain the load flow studies procedure with expressions as per Gauss Seidel method for power system having all types of buses. **(08 Marks)**

c. Using G – S load flow procedure, determine the bus voltages at buses – 2 and 3 of the system shown in Fig.Q.3(c) at the end of first iteration. The values shown are pu impedances. **(08 Marks)**

Fig.Q.3(c)



4 a. Deduce the fast decoupled load flow model clearly stating all the assumptions made. **(08 Marks)**

b. For a given 14 bus power system with bus 1 as slack bus, buses 2 to 11 are PQ buses and bus number 12 to 14 are PV buses. Determine the dimension of Jacobian matrix of NR method of load flow studies. If the system bus umber 12 to 14 are changed to P-Q buses. Determine the new order of the Jacobian matrix. **(06 Marks)**

c. Compare NR and GS methods for load flow analysis. **(06 Marks)**

PART – B

5 a. Explain the equal incremental cost criterion with reference to economic operation of power systems. **(08 Marks)**

b. Given that the incremental costs of 2 plant-units are
$IC_1 = 0.008P_1 + 8.0$ Rs/Mwh
$IC_2 = 0.0096P_2 + 6.4$ Rs/Mwh.
Determine the economic operation schedule and corresponding cost of generation, if the maximum and minimum loading on each unit is 625 MW and 100MW respectively. The demand is 900 MW and the losses are negligible. Also determine the saving in fuel cost in Rs/hr for the economic distribution of the total load of 900MW compared with equal distribution between the two units. **(12 Marks)**

6 a. Derive the transmission loss formula for a system consisting of n-generating plant supplying several loads inter connected through a transmission network. **(10 Marks)**

b. Compute the loss coefficients for the network shown in Fig.Q.6(b). Using the given data:
$I_a = 1.0 - J\ 0.15$ pu $\quad Z_a = 0.02 + j\ 0.15$ pu
$I_b = 0.5 - J\ 0.10$ pu $\quad Z_b = 0.03 + j\ 0.15$ pu
$I_c = 0.2 - J\ 0.05$ pu $\quad Z_c = 0.02 + J\ 0.25$ pu. **(10 Marks)**

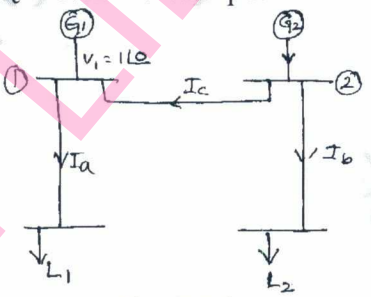


Fig.Q.6(b)

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

b. Explain Milne predictor corrector method. **(10 Marks)**

8 Write short notes on (any four):

a. Performance curve of a thermal power plant.
b. Acceleration factor in load flow solution.
c. Runge-Kutta method for transient stability.
d. Optimal scheduling for hydro thermal plants.
e. Formation Y-bus by inspection method. **(20 Marks)**

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06EE72

Seventh Semester B.E. Degree Examination, June/July 2013
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. What are different modes of heat transfer? Discuss in brief. **(05 Marks)**

b. List the requirements of good-heating element. **(05 Marks)**

c. In a 3ϕ, arc furnace to melt 10 tons of steel in 2 hrs, estimate the average input to the furnace if overall efficiency is 50%. If the current input is 9000 Amps, with the above KW input and the resistance and reactance of furnace leads are 0.003Ω and 0.005Ω resp. Estimate the arc voltage and total KVA taken from the supply?
Assume:
Specific heat of steel = 444K kg^{-1} C^{o-1}
Latent heat of fusion of steel = 37.25 kJ/kg
Melting point of steel = 1370°C. **(10 Marks)**

2 a. What are requirements of good-weld? **(05 Marks)**

b. How are welding methods classified? With a neat sketch explain them. **(10 Marks)**

c. Compare carbon arc welding and metallic arc welding. **(05 Marks)**

3 a. Define:
i) Current efficiency
ii) Energy efficiency. **(04 Marks)**

b. Discuss the factors that affect better electro deposition. **(06 Marks)**

c. A rectangular plate 20cm × 10cm is to be coated with Nickel with a layer of 0.2mm thickness. Determine the quantity of electricity in Amp-hr and time taken for the process, assume
Current density = 190 Amp/m^2,
Current efficiency = 90%,
Special gravity of Ni =8.9 grms/cc, ECE of Ni = 0.0003043. **(10 Marks)**

4 a. Define:
i) Luminous efficiency
ii) Depreciation factor
iii) Coefficient of utilization
iv) Space-Ht ratio. **(08 Marks)**

b. Two lamps of 500 watts, with a lamp efficiency of 25 lumens/watt are mounted on two lamp posts 10m apart. THe posts have different heights of 3m and 4m resp. Calculate the illumination at a point, midway between the lamp posts. **(06 Marks)**

c. Determine the effective illumination of a room 12m × 15m illuminated by 15 lamps of 200 watts each. The luminous efficiency of each lamp is 12 lumens/watt. Coefficient of utilization = 0.4. **(06 Marks)**

PART – B

5 a. For a simplified quadrilateral speed. Time curve, show that the speed at the end of coasting period is given by

$$V_2 = \frac{V_1 - \beta_c T + \frac{\beta_C}{\alpha} V_1}{1 - \beta_C/\beta}$$

Where the symbols have usual notations. **(10 Marks)**

b. The distance between two stations is 1km and the schedule speed is 30 kmph, station stoppage time is 20secs. Assuming braking retardation of 3Km Ph Ps and maximum speed 1.25 times the average speed. Determine the acceleration required to run the service if the speed-time curve is approximated by a trapezoidal curve? **(10 Marks)**

6 a. Develop an expression for tractive effort required by train to
i) Accelerate from rest; ii) To overcome gravity; iii) Over-come train resistance. Hence develop the expression for power out-put from the driving axles? **(10 Marks)**

b. A 200 ton motor having 4-motors, each developing 6000 Nm-torque, during acceleration, starts from rest. If the gradient is 30 in 1000, gear ratio of 4 gear transmission efficiency of 90%, wheel radius of 45cm, train resistance of 50N/ton, rotational interia of 10%. Calculate the time taken to attain a speed of 50kmph. If the line voltage is 3000V d.c. and efficiency of motors is 85%. Find the current during notching period? **(10 Marks)**

7 a. Define specific energy consumption. Hence develop the expression for the same, using simplified speed time curve. State the factors affecting the same. **(10 Marks)**

b. An electric train has quadlateral speed time curve as follows:
Uniform acceleration from rest at 2 km phps for 30 secs.
i) Coasting for 50 secs.
ii) Braking time of 20 secs.
The train is moving at a uniform down gradient of 1%, tractive resistance of 40 NW/ton rotational interia effect of 10% dead wt. duration of stop 15 secs and over all efficiency of transmission gear and motor as 75%. Calculate specific energy consumption for the run and its scheduled speed? **(10 Marks)**

8 a. Discuss briefly characteristics of traction motors. Justify – "D.C series motor is ideally suited for traction". **(08 Marks)**

b. Explain the concept of energy saving by series – parallel control. **(06 Marks)**

c. Write briefly on train lightening system. **(06 Marks)**

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06EE73

Seventh Semester B.E. Degree Examination, June/July 2013
High Voltage Engineering

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Draw neat sketches wherever necessary.

PART – A

1 a. List the advantages of high voltage power transmission. **(06 Marks)**
b. Discuss the need of generating high voltage in the laboratory. **(08 Marks)**
c. Mention the important applications of high voltages. **(06 Marks)**

2 a. A steady current of 600μA flows through the plane electrodes separated by a distance of 0.5cm when a voltage of 10kV is applied. Determine town sends first ionization coefficient if a current of 60μA flows when the distance of separation is reduced to 0.1cm and the field is kept constant at the previous value. **(06 Marks)**
b. Derive the equations for town sends first and second ionization coefficients. What is the condition of spark? **(10 Marks)**
c. Explain Paschen's law with breakdown voltage pd curve. **(04 Marks)**

3 a. Explain the suspended particle theory of breakdown in liquids. **(06 Marks)**
b. The following observations were made in an experiment for determination of dielectric strength of transformer oil. Determine the power law equation: **(08 Marks)**

Gap spacing	4	6	8	10
Bd. Voltage (KV)	88	135	165	212

c. What are the desired properties of the solid insulating materials used for power apparatus? List any five solid insulating materials and mention their application areas. **(06 Marks)**

4 a. A 100 KVA, 250V/200KV feed transformer has resistance and reactance of 1% and 5% respectively. This transformer is used to test a cable at 400KV at 50Hz. The cable takes a charging current of 0.5A at 400KV. Determine the series inductance required. Assume 1% resistance of the inductor. Also determine input voltage to the transformer. Neglect dielectric loss of the cable. **(08 Marks)**
b. Derive an expression for ripple voltage of a multistage Cockroft-Walton circuit. **(06 Marks)**
c. Describe the working principle of Tesla coil and state its applications. **(06 Marks)**

PART – B

5 a. A 12 stage impulse generator has capacitors each rated at 0.3μF, 150KV. The capacitance of the test specimen is 400pF. Determine the wave front and wave tail resistance to produce a 1.2/50μs impulse wave. **(06 Marks)**
b. List the components of multistage impulse generator and mention the function of each component. **(08 Marks)**
c. How is the trigatron gap used for triggering impulse generator? **(06 Marks)**

6 a. A generating voltmeter is required to measure voltage between 15KV to 250KV. If the indicating meter reads a minimum current of 2μA and maximum of 35μA, determine the capacitance of the generating voltmeter. Assume that the speed of driving synchronous motor is 1500rpm. **(06 Marks)**

b. With the help of a neat sketch describe the working principle of Klydonograph. **(06 Marks)**

c. Describe the Chubb and Fortes cue method of measuring high voltages. **(08 Marks)**

7 a. With the help of a neat schematic describe how the loss angle and dielectric loss of an insulator can be measured by using a high voltage Schering bridge. **(10 Marks)**

b. What are partial discharges? How are they measured by using balanced detection method? **(10 Marks)**

8 Write short notes on the following:

a. High voltage tests on transformers.

b. High voltage testing of cables.

c. Testing of circuit breakers.

d. Potential dividers. **(20 Marks)**

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06EE74

Seventh Semester B.E. Degree Examination, June/July 2013
Industrial Drives and Applications

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat block diagram state the essential parts of an electric drive system. Explain them briefly. **(06 Marks)**

b. What do you understand by word equalization? How it is achieved in industries? **(06 Marks)**

c. A weight of 500 kg is being lifted up at a uniform speed of 1.5 m/s by a winch driven by a motor running at a speed of 1000 rpm. The moment of inertia of the motor and winch are 0.5 and 0.3 kg/m^2 respectively. Calculate the motor torque and the equivalent moment of inertia referred to the motor shaft. In the absence of weight the motor develops a torque of 100 N-m when running at 1000 rpm. **(08 Marks)**

2 a. With usual notations, derive an expression for temperature rise of a machine. Sketch the temperature rise versus time curve. **(06 Marks)**

b. A constant speed motor has the following duty cycle:
i) Load rising linearly from 200 to 400 kW : 4 minute
ii) Uniform load of 400 kW : 2 minute.
iii) Regenerative power returned to the supply reducing linearly from 400 kW to 0 : 3 minute.
iv) Remains idle : 4 minute.
Calculate the power rating of the motor, assuming loss to be proportional to (power)^2. **(06 Marks)**

c. Derive an expression to obtain the power rating for short time duty loads. **(08 Marks)**

3 a. With circuit diagram and waveforms, explain the operation of single phase half controlled rectifier control of separately excited d.c.motor for continuous mode of operation. **(10 Marks)**

b. A 220 V, 1500 rpm, 10 A separately excited d.c.motor is fed from a single phase fully controlled rectifier with an a.c. source voltage of 230 V, 50 Hz, $R_a = 2\ \Omega$. Conduction can be assumed to be continuous. Calculate the firing angles for, i) Half the rated motor torque and 500 rpm. ii) Rated motor torque and -1000 rpm. **(10 Marks)**

4 a. Explain the motoring control and regenerative braking of chopper control of separately excited d.c. motor. **(10 Marks)**

b. A 230 V, 1200 rpm, 15 A separately excited motor has an armature resistance of 1.2 Ω. Motor is operated under dynamic braking with chopper control. Braking resistance has a value of 20 Ω. Calculate i) Duty ratio of chopper for speed of 1000 rpm and braking torque equal to 1.5 times rated motor torque. ii) Motor speed for duty ratio of 0.5 and motor torque equal to its rated torque. **(10 Marks)**

PART – B

5 a. Explain the effect of unbalanced voltage and single phasing on the induction motor performance. **(10 Marks)**

b. A 400 V, star connected, 3 phase, 6 pole, 50 Hz induction motor has the following parameters referred to the stator. $R_S = R_r' = 1\,\Omega$, $X_S = X_r' = 2\,\Omega$.
For regenerative braking operation of this motor. Calculate the maximum overhauling torque it can hold and range of speed for safe operation. **(10 Marks)**

6 a. With circuit diagram and waveforms explain the operation of voltage source inverter fed induction motor drive. **(10 Marks)**

b. A 440 V, 3 phase, 50 Hz, 6 pole, 645 rpm delta connected induction motor has following parameters referred to the stator $R_S = 2.0\ \Omega$, $R_r' = 2.0\,\Omega$, $X_S = 3\ \Omega$, $X_r' = 4\,\Omega$. When driving a fan load at rated voltage it runs at rated speed. The motor speed is controlled by stator voltage control. Calculate the motor terminal voltage at 800 rpm. **(10 Marks)**

7 a. With circuit diagram, explain the self controlled synchronous motor drive, employing the load commutated thyristor inverter. **(10 Marks)**

b. With block diagram, explain the operation of variable frequency control of multiple synchronous motor drive. **(10 Marks)**

8 a. Classify the drives used in cement industry and explain them. **(08 Marks)**

b. Write the comparisons between the line shaft drive and sectional drive of paper machine drive. **(04 Marks)**

c. What are the requirements in steel mills? Explain with reasons motor used in steel mills. **(08 Marks)**

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06EE763

Seventh Semester B.E. Degree Examination, June/July 2013
Energy Auditing and Demand Side Management

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain briefly world energy scenario with a note on energy consumption pattern in India. **(08 Marks)**

b. Explain the three pronged approach to energy conservation. **(06 Marks)**

c. Summerise the distribution code as applied to an electric supply system. **(06 Marks)**

2 a. Develop the cash flow model for uniform series present worth amount. **(06 Marks)**

b. Write a note on payback analysis. **(06 Marks)**

c. An electric motor consumes 20,000 units per year. the energy charges are Rs. 6/- per KWh and the life span of the motor is 20 years. it is decided to upgrade the motor with an intention to save energy. Company 'A' projects a saving of 5% at an additional cost of Rs. 25,000/-. Company 'B' projects a saving of 10% at an additional cost of Rs. 35,000/-. Use present worth method to suggest which company to be recommended. Assume minimum rate of return as 20%. **(08 Marks)**

3 a. Define the term energy audit. Explain the need for such a study in an industry. **(06 Marks)**

b. Enumerate the difference between preliminary energy audit and detailed energy audit methodologies. **(08 Marks)**

c. Write a note on energy audit instruments. **(06 Marks)**

4 a. Explain the following terms :
i) Depreciation
ii) Time value of money concept. **(10 Marks)**

b. Write short notes on :
i) Typical AC power supply scheme
ii) Power triangle. **(10 Marks)**

PART – B

5 a. Define the term tariff and explain the objectives of tariff. **(08 Marks)**

b. Explain the term availability based tariff (ABT). **(06 Marks)**

c. The maximum demand of a consumer is 20 A at 220 V and his total energy consumption is 8760 KWh. IF the energy is charged at the rate of 20 paise per unit for 500 hours use of maximum demand per annum plus 10 paise for additional units calculate :
i) Annual bill
ii) Equivalent flat rate
Assume load factor = 1, power factor =1. **(06 Marks)**

6 a. Write a note on the following :
   i) Location of capacitor in a typical motor control centre
   ii) Energy efficient motors
   iii) Good practices in lighting. **(10 Marks)**

   b. Define the term demand side management (DSM) and write a note on scope and evolution of the concept of DSM. **(10 Marks)**

7 a. With the help of block diagram, explain the steps involved in planning and implementation of DSM. **(08 Marks)**

   b. Explain the concept of load management as a strategy for DSM. **(06 Marks)**

   c. Briefly explain the application of load control as an objectives of DSM. **(06 Marks)**

8 a. Explain the energy conservation opportunities in the industrial sector. **(06 Marks)**

   b. What are the factors restraining DSM progrmmes. **(06 Marks)**

   c. Explain the hierarchical structure of corporate level organization involved in energy conservation programme. **(08 Marks)**

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