6E3109

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6E3109

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014

Electrical Engineering

6EE 1 Modern Control Theory

Common for EX, EE

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205)

1. _____ 2. _____

UNIT-I

Q.1 (a) Explain the concept of linear vector space linear Independence. [6]

(b) Are the following sets linearly independent in the field of real numbers? [10]

(i) $\begin{bmatrix} 4 \\ -9 \\ 11 \end{bmatrix}, \begin{bmatrix} 2 \\ 13 \\ 10 \end{bmatrix}, \begin{bmatrix} 2 \\ -4 \\ 1 \end{bmatrix}$

(ii) $\begin{bmatrix} 1+i \\ 2+3i \end{bmatrix}, \begin{bmatrix} 10+2i \\ 4-i \end{bmatrix}, \begin{bmatrix} -i \\ 3 \end{bmatrix}$.

OR

Q.1 (a) Consider the following matrix with coefficients in R.

$$L = A = \begin{bmatrix} 3 & 2 & -1 \\ -2 & 1 & 0 \\ 4 & 3 & 1 \end{bmatrix} \qquad b = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$$

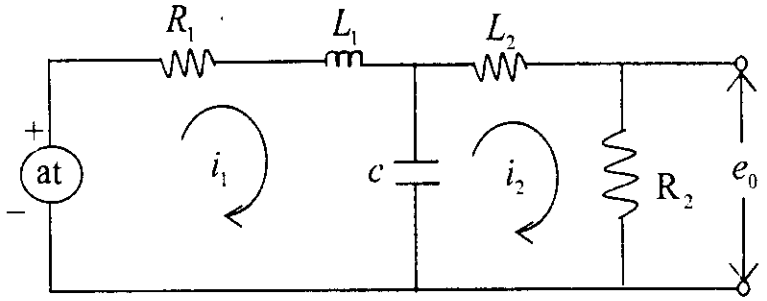
Find the Representation of A with respect to the basis $\{b, Ab, A^2b\}$ [10]

(b) Explain the concept of Linearity & Causality. [6]

UNIT-II

Q.2 (a) Explain the difference between Modern Control theory and Conventional Control theory. [6]

(b) Write state equations for the networks shown below: [10]



OR

Q.2 (a) Construct the state model for a system characterized by the differential equation.

$$\frac{d^3y}{dt^3} + \frac{6d^2y}{dt^2} + \frac{11dy}{dt} + 6y = U$$ [10]

(b) Explain the following terms:

(i) State variables. [3]

(ii) State vector [3]

UNIT-III

Q.3 (a) Derive the transfer function from state-model. [8]

(b) Find out the transfer function:

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} -5 & -1 \\ 3 & -1 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 5 \end{bmatrix} U$$

$$y = [1 \quad 2] \begin{bmatrix} X_1 \\ X_2 \end{bmatrix}$$ [8]

OR

Q.3 (a) A feed back system is characterized by the closed loop transfer function-

$$T(s) = \frac{S^2 + 3S + 3}{S^3 + 2s^2 + 3s + 1}$$

Draw a suitable signal flow graph and therefore construct a state model of the systems. [10]

(b) Derive State - Space representation using canonical variable's equation. [6]

UNIT-IV

Q.4 (a) Obtain the state transition matrix $\phi(t)$ for the matrix $A = \begin{bmatrix} 0 & -2 \\ 1 & -3 \end{bmatrix}$ [8]

(b) Obtain the time response of the system-

$$A = \begin{bmatrix} 0 & 1 \\ -2 & 0 \end{bmatrix} \quad \dot{x} = Ax \quad X(0) = [1 \quad 1]'$$ [8]

OR

Q.4 (a) Define the concept of Controllability & Observability. [6]

(b) Consider the system with state equation -

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} U$$

Check the above system whether controllable or not. [6]

(b) Mention the Ackerman's Formula. [4]

UNIT-V

Q.5 (a) Find the relation between S and Z domain and comment on mappings. [8]

(b) Define the initial & final value theorem for Z transform. [8]

OR

Q.5 (a) Write short note on digital P I D Controller and sampled data Control System [4+4]

(b) Find the Z transform -

(i) $G(s) = \dfrac{10}{s(s+1)(s+3)}$ [3]

(ii) $G(s) = \dfrac{10}{s^2+2s+2}$ [3]

(iii) $f(t) = t^2$ [2]

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6E3110

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014
Electrical Engineering
6EE 2 High Voltage Engineering

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions,** selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. Nil 2. Nil

UNIT-I

Q.1 (a) Explain Townsend's breakdown mechanism for gases starting from the expression of current at anode for increase in voltage between anode and cathode. [8]

(b) For breakdown in liquids show that breakdown strength (E) depends upon concentration of particles N. radius r of particle, viscosity □ of liquid and temperature T of the liquid. [8]

OR

Q.1 (a) Explain breakdown mechanism in solids and describe thermal breakdown phenomenon observed in breakdown for solid dielectrics. [10]

(b) Describe the applications of gases in power system & oil in power apparatus. [6]

UNIT-II

Q.2 (a) Describe the method of high voltage DC generation in which charging source transformer charges the capacitance through a number of rectifiers. [10]

(b) Describe how data are obtained regarding lightning surges produced on transmission lines & other equipments. [6]

OR

Q.2 (a) Describe the sphere gap method for measurement of high voltage by drawing neat diagram & explaining working of method. [10]

(b) Draw neat diagrams for cascaded for cascaded transformers method for high AC voltage generation and Marx's multistage impulse generators. [6]

UNIT-III

Q.3 (a) Describe the working of basic high voltage Schering bridge for measurement of dielectric loss of capacitances by drawing neat figure. [8]

(b) Describe the loss factor & specific resistivity measurement method for an insulation specimen. [8]

OR

Q.3 (a) Describe the working of basic narrow bard partial discharge measuring circuit by drawing a neat figure. [8]

(b) Draw the equivalent circuit for a typical partial discharge and also give same examples of partial discharges. [8]

UNIT-IV

Q.4 (a) What are various reasons of over voltages? Describe the overvoltage due to lightning. [8]

(b) Describe the mechanism of lightning stroke and Wilson's theory of charge separation for lightning phenomenon. [8]

OR

Q.4 (a) Show that the current and voltage waves get attenuated exponentially as they travel over the line and magnitude of attenuation depends upon parameters of line. [10]

(b) Describe the travelling wave phenomenon reflection & refraction at a T – junction of line. [6]

UNIT-V

Q.5 (a) Describe the junction of Ground rods, counterpoise with regard to overvoltage protection. Also explain what is Arcing horn phenomenon? [8]

(b) Describe the basic requirements of surge diverters. Explain metal oxide gapless type lightning arrester. [8]

OR

Q.5 (a) Explain insulation coordination problem. Describe the basic impulse insulation levels. [8]

(b) Describe the volt – time curves construction and purpose by drawing neat diagram & mentioning all specifications of curve in diagram. [8]

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6E3111

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6E3111

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014
Electrical Engineering
6EX3 Protection of Power System

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1 (a) What are the principal types of faults in a power system? In what way is a fault harmful to the power systems? [4+4]

(b) Find the output of CT having a transformation ratio of 100/s and secondary resistance of 0.1 Ohm. Its secondary terminals are connected to a relay whose bursar is 4.5.VA. the resistance of connecting leads is 0.15 Ohms. [8]

OR

Q.1 (a) Explain what is meant by primary and secondary backup protection. [8]

(b) Describe the application and operating principe of CVT. In what sense it is more effective than potential transformer. [6+2]

UNIT-II

Q.2 (a) Describe the construction and principle of operation of Disk type induction over-current relay. Derive torque equation. [4+4]

(b) Describe the construction and operation of a directional over-current relay. [8]

OR

Q.2 (a) Explain how time and current grading principles are applied in the protection of power system. [4+4]

(b) Distinguish over-current relays on the basis of definite time, inverse time and inverse definite minimum time (IDMT) characteristics. [8]

UNIT-III

Q.3 (a) Explain the protection of alternator against overheating of stator. [8]

(b) Describe how differential protection can be used against stator inter-turn faults in an alternator. [8]

OR

Q.3 (a) What are the consequences of failure of prime mover of an Alternator? How the protection against such fault is implemented? [2+6]

(b) Explain the causes and effects of unbalanced loading of an Alternator. Also explain the protection scheme associated with it. [2+6]

UNIT-IV

Q.4 (a) What is magnetizing inrush current in a power transformer? Explain the protection scheme required to prevent the faults caused by heavy magnetizing inrush currents in a power transformer. [2+6]

(b) Explain the percentage differential protection scheme applied for a Y–Δ connected power transformer. [8]

OR

Q.4 (a) How frame leakage protection is applied for bus-bar protection. Explain with suitable diagram? [8]

(b) Explain high impedance relay scheme for bus-bar protection. [8]

UNIT-V

Q.5 (a) Briefly explain the construction, operating principle and characteristic of an electromagnetic impedance relay. [8]

(b) Explain the importance and basic principle of distance protection of a transmission line. [8]

OR

Q.5 (a) What is meant by single phasing of an Induction motor? What are the hazards of single phasing and how it could be perverted? [2+2+4]

(b) What are the possible causes of earth faults in an induction motor? Explain the application of earth fault relay for the protection of induction motor. [2+6]

6E3112

Roll No. _____ Total No of Pages: 7

6E3112

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014

Advanced Power Electronics

6EE4 Elect. Engineering

Common for EX, EE

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. _____ 2. _____

UNIT-I

Q.1 (a) Describe the operation of 3-ϕ, 3-wire AC thyristor controlled controller with neat power diagram and V-I waveforms. Also, discuss, why 3-ϕ, 3-wire AC regulators are preferred over 3-ϕ, 4- wire system. [8]

(b) A single phase 220V, 1KW electric room heater is connected across 220V power supply through a TRIAC. For a delay angle of 90°, calculate the power dissipated by the heater element. [4]

(c) In open loop volts/ Hz control of induction motor drive, why should non- linear volts/Hz gain is preferred in over-modulation region of PWM. [4]

OR

Q.1 (a) A capacitor is connected across a Thyristor Control Rectifier to control the fire capacitance VAR. Calculate for $\alpha = 135°$ (for figure 2.1)

(i) total reactive power.

(ii) fundamental components of input – line current.

(iii) total harmonic distortion of inductive current alone.

(iv) total harmonic distortion of line current. [10]

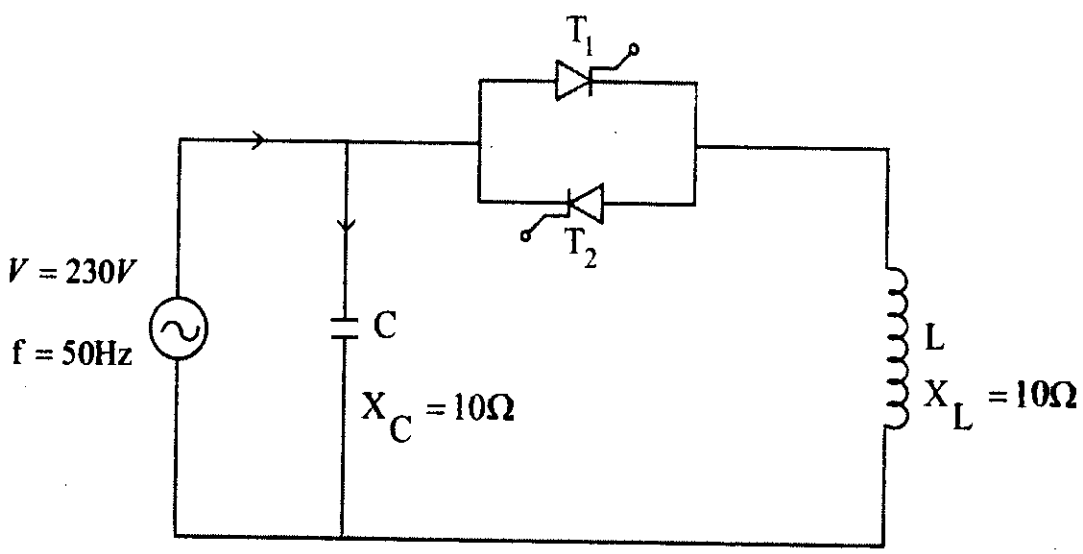

Figure 2.1

(b) For a 1-ϕ AC voltage regulator, develop a relation between conduction angle γ and firing angle α, and plot their variation as a function of load phase angle ϕ. Under what condition, conduction angle γ, becomes equal to π. [6]

UNIT-II

Q.2 (a) A 3-ϕ bridge inverter is fed from 200V DC source. The inverter is operated in 180° conduction mode and is supplying inductive, star connected load with R=10Ω and L=20mH. The inverter frequency is f_o = 50 Hz. Calculate:

(i) Instantaneous line–to–line voltage & current is fourier series.

(ii) Total harmonic distortion.

(iii) Distortion factor

(iv) Average & rms switch current. [10]

(b) State the need for reduction of harmonics in Inverter. Discuss various methods for reduction of harmonics or improvement in wave shapes. [6]

OR

Q.2 (a) What is the function of circuit shown in fig 2.1. Also, discuss its advantages over a conventional thyristor converter. [6]

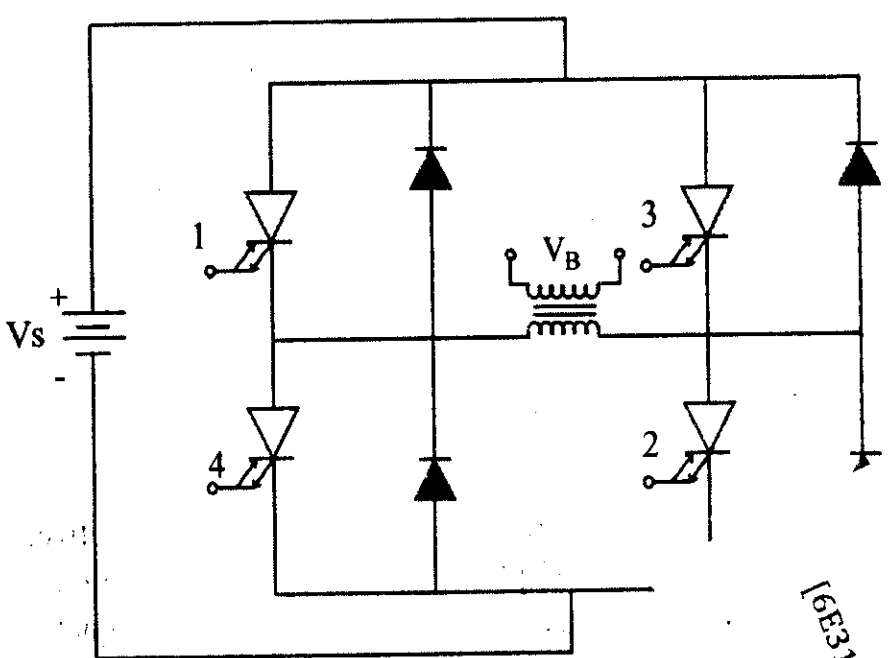

Figure 2.1

[6E3112] [16]

the

(b) Explain the operation of an auxiliary- commutated (McMurray inverter) single – phase bridge inverter by drawing voltage & current waveforms. [10]

UNIT-III

Q.3 (a) A 3-ϕ to 1- ϕ cycloconverter employs six pulse bridge converters. Each converter is supplied from delta/ star transformer with per phase turns ratio of 3:1. The supply voltage is 410V, 50Hz. The R_L load has R=4Ω and at low frequency $\omega_o L$=3Ω. The commutation overlap and thyristor turn-off time limits the firing in inversion mode to 160°. Calculate -

(i) Fundamental rms output voltage

(ii) R M S output current

(iii) Output power [8]

(b) A 1-ϕ to 1-ϕ centre –tapped cyclo-converter is delivering power to a resistive load. The supply transformer has turns ratio of 1:1:1. The frequency ratio is fo/fs = 1/3. The firing delay angle α for all the thyristors are the same. Sketch the time variations of the following waveforms for $\alpha = 0°$ and $\alpha = 45°$.

(i) Supply voltage.

(ii) Output current.

(iii) Supply current. [8]

OR

Q.3 (a) A six- pulse, blocked group cycloconverter is fed from a three phase, 600V (line), 50Hz supply. The supply was an inductance of 1.146mH /Phase. If the cycloconverter is supplying a variable resistive load with a current of 28A, estimate the peak and RMS value of load voltage for firing angles of 0°, 30°and 60°. [8]

(b) Describe the control scheme for a cycloconverter using voltage- sensing principle of convertor group selection. Also, draw the various voltage waveforms of a control scheme. [8]

UNIT-IV

Q.4 (a) A fly back converter is operated in a continuous mode from a supply of 14V to 30V with two outputs 12V at 0.6A and -12V at 0.6A. The switching power supply is used to power some drivers that have intermittent load demands. The load can vary from 0.1 to 0.5 Amp. Assuming the efficiency of the converter to be 80% and switching frequency to be 50 KHz, determine:

(i) Ratings of transistor

(ii) Ratings of rectifying diode

(iii) Primary winding inductance & the number of turns of the primary and the secondary, if the core exhibits 80MH per 1100 turns. [16]

OR

Q.4 (a) With the help of neat circuitory and waveform, explain the operation of forward converter with tertiary winding. Also test the advantage and disadvantage of the same. [10]

(b) Explain the effect of series coupling capacitor on the performance of half bridge converter. [6]

UNIT-V

Q.5 (a) A SMPS is to be designed with following specification: E_o = 12V, I_o= 12A, f_s = 60 KHz, AC rectified mains with LC filter: 230V, 50Hz. A forward converter operating in continuous–conduction mode with demagnetizing winding is chosen. Assuring all ideal conditions, except presence of transformer magnetizing inductance, determine:

(i) turns ratio of demagnetizing winding with primary winding at maximum duty cycle of 0.6.

(ii) switch voltage rating allowing 50% voltage of input voltage as spike.

(iii) d.c. supply current at full load. [10]

180

(b) Write short note on: [2x3]

(i) Resonant AC power supply

(ii) SMPS

OR

Q.5 (a) Discuss the operation of Bidirectional AC power supply. [8]

(b) Discuss various control applications used in AC power supply in detail. [8]

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6E3113

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014

Electrical Engineering

6EE 5 Data Structures In C

Common for EX, EE

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1 (i) Discuss the following asymptotic notations with example. [10]

(a) Big – oh (O)

(b) Small – oh (o)

(c) Theta (θ)

(d) Omega (Ω)

(e) Small-omega (ω)

(ii) Show that the solution to -

$T(n) = 2T(\lfloor n/2 \rfloor) + n$ is o (n. log n) [6]

OR

(i) What is circular linked list? Write an algorithm to add a node at the end of circular linked list. [4+6]

(ii) Show that the worst case running time of heap sort is Ω (n. log n) [6]

UNIT-II

Q.2 (i) Suppose multi-dimensional arrays A & B are declared using - [4+4]

A (- 2 : 2 , 2 : 22) & B (1 : 8 , -5 : 5 , -10 : 5)

then find -

(a) Length of each dimension. & the number of elements in array A & array B.

(b) Consider the element B [3, 3, 3] in B, find the effective indices E_1, E_2, E_3 & the address of the element, assuming Base (B) = 400 & there are w = 4 words per memory location. (assuming B is stored in column – major order)

(ii) What are tri-diagonal & triangular matrices? How is sparse matrix stored in the memory of a computer? Explain with the help of suitable examples. [4+4]

OR

Write algorithms to perform following operations on sparse-matrices [8+8]

(i) Addition of sparse-matrices

(ii) Multiplication of sparse –matrices

UNIT-III

Q.3 (i) Write an algorithm to evaluate a postfix expression given as a string of characters using stack. [10]

(ii) Evaluate the postfix expression given below & explain the intermediate steps & also find the contents of the stack - [6]

7 2 3 + - 2 /

OR

(i) What is circular queue? Write a algorithm to perform following operations on a circular queue - [2+4+4]

(a) Insertion in circular Queue.

(b) Deletion in circular Queue.

(ii) Translate the following infix expressions into postfix notations- [6]

(a) $((A+B) * D) \uparrow (E - F)$

(b) $A + (((B - C) * CD - E) + F) / G) \uparrow (H-J)$

UNIT-IV

Q.4 (i) Define max. heap & min. heap. How will you represent a max. heap as on Array? Write a algorithm to insert an element to a max.heap. [2+3+7]

(ii) Explain binary tree traversals by using a suitable example. [4]

OR

(i) What is height balance tree? Construct an AVL search tree by inserting the given elements- [4+8]

6, 7, 8, 12, 15, 17, 9, 10

(ii) Define a B-tree of order m. Give an example of a B-tree of order 2. [4]

UNIT-V

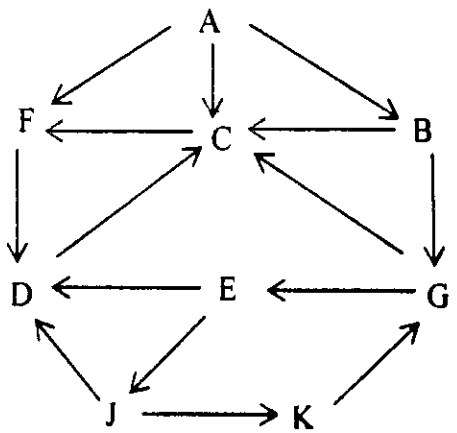
Q.5 Explain BFS & DFS graph traversal algorithm. Then find- [8+4+4]

(a) Minimum path from node A to node J in given graph.

(b) All the nodes reachable from node J.

(including node J itself)

Graph:



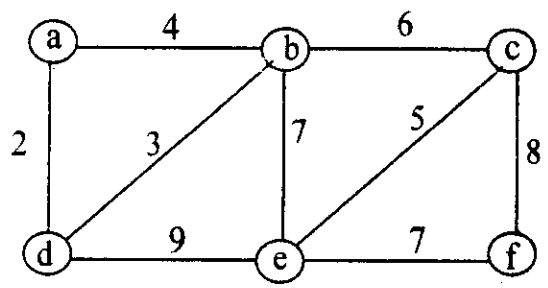
OR

(i) Write an algorithm for merge-sort. Sort the sequence of numbers using the algorithm - [4+4]

42, 23, 74, 11, 65, 57, 94, 36, 99, 87, 70

(ii) let G be an undirected connected graph. By using Kruskal's algorithm find minimum cost spanning tree & its cost. [8]

Graph (G):



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6E3115

B. Tech. VI Sem. (Main & Back) Exam., May/June-2014

Electrical Engg.

6EE 6.2 Power System Instrumentation

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.*

Units of quantities used/ calculated must be stated clearly.

Use of following supporting material is permitted during examination.

1. _____ 2. _____

UNIT-I

Q.1 (a) The following 10 observations were recorded when measuring a voltage 41.7, 42.0, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5, 41.8

Find: [8]

(i) Probable error of one reading.

(ii) Standard deviation.

(b) Define the following for Gaussian distribution of data: [8]

(i) Precision index.

(ii) Standard deviation of mean.

OR

Q.1 (a) A circuit was tuned for resonance by eight different students and the values of resonant frequency in KHz were recorded as 432, 447, 444, 435, 446, 444, 436 and 441. Calculate. [8]

(i) Standard deviation.

(ii) Variance.

(b) Define the following with suitable examples: [8]

(i) Systematic errors.

(ii) Random errors.

UNIT-II

Q.2 (a) Explain the following characteristics of transducers: [8]

(i) Input characteristics.

(ii) Transfer characteristics.

(b) Explain the Construction and working principle of K-type thermocouple. [8]

OR

Q.2 (a) Explain the following with suitable diagrams: [8]

(i) Bourden tubes.

(ii) Bellows.

(b) Explain the construction and working principle of seismic accelerators with suitable examples. [8]

UNIT-III

Q.3 (a) Explain the working principle of function generator with block diagram. [8]

(b) Explain the importance of sample and hold circuit with suitable diagrams. [8]

OR

Q.3 (a) Explain the working of frequency to voltage converters. [8]

(b) Discuss about the shielding and grounding circuit with suitable applications, advantages and disadvantages. [8]

UNIT-IV

Q.4 (a) What do you mean by power factor. Explain the method of measurement of power factor. [8]

(b) Discuss about the active and reactive power in the different plants. [8]

OR

Q.4 (a) Explain the working principle of single phase induction type energy meter. [8]

(b) Discuss about the various methods of phase angle and frequency measurements with neat sketches. [8]

UNIT-V

Q.5 Write short notes on the following:

(a) Capacitive voltage transformers. . [8]

(b) Transient performance of C. T. [8]

OR

Q.5 Write short notes on the following:

(a) Wilson compensation method for reduction of errors in current transformers. [8]

(b) Protection circuits of current transformers. [8]
