



6th Semester End Term Examination: 2021-22.

Subject : Control System

Course : B.TECH [EEEE]

Full Marks : 70

Roll No:

Time : 3 Hours.

Instructions to the Candidates:

- Read the question paper very carefully.
- Start writing from 2nd page onwards; Don't Write On The 1st Page Backside.
- Question Paper is divided into Three Parts -A, B & C.
- Part-A is containing 12 multiple choice questions.
- Part- B containing SIX questions out of which FOUR questions are to be answered.
- Part C containing FOUR questions out of which TWO questions are to be answered.
- Do not write anything except your Roll No. on the question paper.
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PART - A

Multiple Choice Questions

[12x1=12]

1. Which one of the following applications software is used to obtain an accurate root locus for?
a) LISP
b) MATLAB
c) dBase
d) Oracle
2. Unit impulse response of a system in Laplace transform gives
a) Transfer function
b) System gain
c) unit step function
d) None of these
3. Gain margin is:
a) It is a factor by which the system gain can be increased to drive it to the verge of instability
b) It is calculated at gain cross over frequency
c) It is calculated at phase cross over frequency
d) Both a and c

PART - B

Answer any FOUR out of SIX

[4x7=28]

1. Compare open loop control system with closed loop control system. Write down major advantages and disadvantages of open loop control systems
2. Write a short note on standard input test signals.
3. Find the time response of a first order control system subjected to unit step input function.
4. Write a brief notes on Routh Hurwitz criterion. Write limitations of Routh Hurwitz criteria also
5. What is polar plot? Sketch the shape of the polar plot for the transfer function $G(s) = \frac{k}{sT+1}$
6. What is control system compensation? What are the effects of Lead/Lag/ Lag-Lead compensation network?

PART-C

Answer any TWO out of FOUR

[2x15=30]

1. Write the properties of root locus diagram with suitable examples.
2. What is bode plot? Draw the bode plot for $G(s) = \frac{8}{s}$
3. Explain the term with suitable diagrams/ examples
 - i) Marginally stable system
 - ii) Conditional stability
 - iii) Absolute stability
 - iv) Relative stability
 - v) Transfer function
4. What is understood by the term "state transition matrix" ? write the state model for system having transfer function given below:

$$\frac{C(s)}{R(s)} = \frac{2}{s^3+4s^2+6s+8}$$

4. The overall transfer function of two blocks in parallel are
 - a) Sum of individual gain
 - b) Product of individual gain
 - c) Difference of individual gain
 - d) Division of individual gain
5. Transfer function of the system is defined as the ratio of Laplace output to Laplace input considering initial conditions _____
 - a) 1
 - b) 2
 - c) 0
 - d) infinite
6. Standard test signals in control system are:
 - a) Impulse signal
 - b) Ramp signal
 - c) Unit step signal
 - d) All of the mentioned
7. A second order control system with $\xi < 0$ is always
 - a) Stable
 - b) Marginally stable
 - c) Unstable
 - d) Inherently stable
8. The necessary condition for the stability of the linear system is that all the coefficients of characteristic equation $1+G(s)H(s) = 0$, be real and have the :
 - a) Positive sign
 - b) Negative sign
 - c) Same sign
 - d) Both positive and negative
9. When the number of poles is equal to the number of zeroes, how many branches of root locus tends towards infinity?
 - a) 1
 - b) 2
 - c) 0
 - d) Equal to number of zeroes
10. When human being tries to approach an object, his brain acts as,
 - a) An error measuring device
 - b) A controller
 - c) An actuator
 - d) An amplifier
11. The transfer function of a LTI system is given as $1/(s+1)$. What is the steady-state value of the unit-impulse response?
 - a) 0
 - b) 1
 - c) 2
 - d) Infinite
12. If the gain of the critical damped system is increased it will behave as
 - a) Oscillatory
 - b) Critically damped
 - c) Overdamped
 - d) Underdamped



6th Semester End Term Examination: 2021-22.

Subject : Bio Medical Sensor and Transducer Roll No:
Course : B.TECH [EEEE]
Full Marks : 70 Time : 3 Hours.

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PART - A

Multiple Choice Questions

[12x1=12]

1. Unwanted signal at the output due either to internal sources or to interference is called _____
a) offset
b) drift
c) noise
d) threshold
2. The ability of the sensor to see small differences in reading is called _____
a) resolution
b) offset
c) drift
d) linearity
3. Source of Bioelectric potential is _____ in nature.
a) electronic
b) ionic
c) electric
d) mechanical
4. The principal ion that is not involved with the phenomena of producing cell potentials is _____
a) sodium
b) potassium
c) potassium
d) hydroxide

5. The variation of the electrical potential associated with the passage of a pulse along the membrane of a muscle cell or a nerve cell is called _____
- muscle potential
 - resting potential
 - action potential
 - half cell potential

6. Gauge factor is given by which of the following relation?

- $S = \Delta R / R \Delta L$
- $S = R / (\Delta L / L)$
- $S = \Delta R / (\Delta L / L)$
- $S = (\Delta R / R) / (\Delta L / L)$

7. Which of the following is the value for the resting potential of a cell?

- 70mV
- 100mV
- 60mV
- 20mV

8. Which of the following is the value for the action potential of a cell?

- 70mV
- 100mV
- 20mV
- +20mV

9. Electrocardiography was invented by _____

- Willem Einthoven
- Werner Forssmann
- Robert Koch
- Gertrude B. Elion

10. MRI stands for _____

- Mechanical Resonance Imaging
- Magnetic Resonance Imaging
- Mutually Related Imaging
- Magnetic Resultant Imaging

11. The basic functional unit of nervous system is _____

- nerves
- neuron
- axon
- dendrite

12. Which of the following devices convert pressure to displacement?

- Diaphragm
- Capsule
- Bellow
- all of these

- What is action potential and Resting potential explain it with neat and clean diagram.
- Write a short note on cardiovascular system of human body
- Describe the Basic principles of MOSFET biosensors & BIOMEMS.

PART-C

Answer any TWO out of FOUR

[2x15=30]

- What is instrument? Give classification of transducers with their transduction principles & related examples
- Explain construction & working of LVDT with its merits and demerits
- Explain the thermocouple temperature transducer in detail with its merits and demerits.
- What is ECG? How it is measured? Explain briefly.

PART - B

Answer any FOUR out of SIX

[4x7=28]

- Differentiate between primary and secondary transducer with suitable example.
- Write a short note in capacitive transducer.
- What is biological sensor? Write a short note on biological sensors/receptors in human body.



ARKAJAIN
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6th Semester End Term Examination: 2021-22.

Subject : Protection of Power Apparatus and System -I

Course : B.TECH [EEE]

Full Marks : 70

Roll No:

Time : 3 Hours.

Instructions to the Candidates:

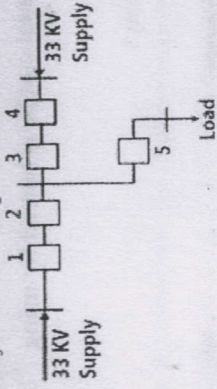
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PART - A

[12x1=12]

Multiple Choice Questions

1. The distribution system shown in the figure is to be protected by over current system of protection. For proper fault discrimination, directional over current relays will be required at locations



- a. 1 and 4
b. 1, 4 and 5
c. 2 and 3
d. 2, 3 and 5
2. If the fault occurs near the impedance relay, the V/I ratio will be
- a. Constant for all distances
b. Lower than that of if fault occurs away from the relay
c. Higher than that of if fault occurs away from the relay

12. Plug setting multiplier is defined as the ratio of:
- Fault current in relay coil / Pick up current
 - Fault current in relay coil / Pick up current
 - Fault current in relay coil \times Transformer secondary turns
 - Fault current in relay coil / Transformer secondary turns

PART - B

Answer any FOUR out of SIX

[4x7=28]

- What is protective zone, Draw 3 zone protection of power system power fed from one end?
- What are the methods of fault discrimination in power system protection?
- What is differential protection, Draw the differential protection arrangement of delta star transformer?
- A 3-phase transformer having line-voltage ratio of 0.4 kV/11kV is connected in star-delta and protective transformers on the 400 V side have a current ratio of 500/5. What must be the ratio of the protective transformers on the 11 kV side?
- Discuss desirable characteristics of protective relay.
- What are the cause of over voltages in power system?

PART-C

Answer any TWO out of FOUR

[2x15=30]

- Discuss harmonic restrain relay with the help of circuit diagram.
- Discuss block diagram & flow chart of microprocessor based mho relay.
- What are the different types of bus bar fault? Explain any two with neat diagram.
- Define Merz-Price circulating current scheme protection of alternator with neat sketch. A star-connected, 3-phase, 10 MVA, 11 kV alternator is protected by Merz-Price circulating-current principle using 1000/5 amperes current transformers. The star point of the alternator is earthed through a resistance of 7.5 Ω . If the minimum operating current for the relay is 0.5 A, calculate the percentage of each phase of the stator winding which is unprotected against earth-faults when the machine is operating at normal voltage

- For protection of parallel feeders fed from one end the relays required are:
 - Non-directional relays at the source end and directional relays at the load end.
 - Non-directional relays at both the ends.
 - Directional relays at the source end and non-directional at the load end.
 - Directional relays at both the ends

- The set direction of directional relay is always
 - In normal current direction
 - In fault current direction
 - Neither (a) nor (b)
 - Determined by voltage coil polarities

- A transmission line is protected by
 - Inrush protection
 - Distance protection
 - Time graded and current graded over current protection
 - Both (b) and (c)

- Which of the protection is provided by buchholz relay?
 - Short circuit in winding
 - Local over heating
 - Earth fault in winding
 - All of above

- Reverse running of alternator is due to
 - Over voltage
 - Failure of prime mover
 - Over current
 - None of above

- The selectivity of the system is increased by:
 - Considering the system as a single block
 - Dividing the system into various protection zones
 - Dividing system into two large blocks
 - None of these

- Time graded protection of a radial feeder can be achieved by using
 - Definite time relay
 - Inverse time relay
 - Both definite and inverse time relays
 - None of the above

- Which fault is related to power transformer?
 - Overheating of core
 - Phase to Phase fault
 - Earth fault
 - All of above

- A mho relay is used for protection of:
 - Protection of a transformer against external fault
 - Long Transmission Line
 - Protection of a transformer against all the internal faults and external fault
 - Medium Length lines