Sylhet Engineering College, Sylhet
(Shahjalal University of Science & Technology)
Department of Electrical & Electronic Engineering

Final Examination, 2023 | **4th Year 2nd Semester**
Course No: EEE 823 | **Course Title: Fundamentals of Biomedical Engineering**
Time: 03 (Three) hours | **Full Marks: 60**

N.B. : (i) Answer any three question from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-------N/A----------

PART-A
(Answer any **THREE** questions)

1. a) What do you mean by Arrythmia? What is first degree AV block? **3**
   b) Discuss some major functions of membrane proteins. **7**
2. a) Why Ag-AgCl electrode is stable? Discuss this electrode with a typical Electrode circuit model. **3**
   b) Draw with appropriate diagram that how Elastic Resistive Transducers can be used in plethysmography. **7**
3. a) What is passive transport? **3**
   b) Why demand pacemaker is used? Discuss its working principle with block diagram. **7**
4. a) A 0.1m long by 0.005m diameter elastic resistive transducer has a resistance of 1kΩ. **4**
      I. Calculate the resistivity of the electrically conductive material inside the transducer.
      II. Calculate the resistance of the transducer after it has been wrapped around a patient's chest having a circumference of 1.2m. Assume that the cross-sectional area of the transducer remains unchanged.
   b) What are applications of PCG? Discuss various scanning modes in ultrasound. **6**

PART-B
(Answer any **THREE** questions)

5. a) What are biological effects of EMF in human body? Discuss how the capacitance varies in the Butterfly type transducer. **4**
   b) Why ethics is important in Biomedical Engineering? Mention IEEE code of ethics for BME. **6**
6. a) How does a cell achieve depolarization? **4**
   b) Which Law is followed in Pulse Oximetry? How a typical pulse oximeter works? **6**
7. a) What kinds of interferences may occur around a pacemaker? What are the characteristics of Cardiac conduction cells. **4**
   b) What are the advantages of Electronic Stethoscope? A strain gauge transducer is constructed in a Wheatstone bridge circuit configuration. In the null condition, each element has a resistance of 200 ohms. When a force is applied, each resistance changes by 10 ohms. Find the output voltage if a 10V excitation potential is applied to the bridge. **6**
8. a) What is DSA in angiography? Discuss the Seldinger Technique for catheter insertion with figure. **4**
   b) Why Hydrogen is an important element in MRI imaging? Describe the construction of Electronic Stethoscope. **6**

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Final Examination, 2023 | **4th Year 2nd Semester**
Course No: EEE 835 | **Course Title: VLSI**
Time: 03 (Three) hours | **Full Marks: 60**

N.B.: (i) Answer any **three** question from each PART (ii) Use separate answer scripts for each PART
(iii) Marks allotted are indicated in the margin (iv) Special Instruction (if any)-------N/A-------

PART-A
(Answer any **THREE** questions)

1.	a)	Explain system on chip. Write applications of system on chip.	03
	b)	Draw the stick diagram for a two-input CMOS NAND gate, clearly indicating the pull-up and pull-down networks along with appropriate layer representations.	07
2.	a)	List the advantages and disadvantages of BiCMOS.	03
	b)	Define BiCMOS. Describe the characteristics of BiCMOS.	07
3.	a)	Illustrate the pull-up of a complementary transistor (CMOS) with a circuit and graph.	03
	b)	Explain rise-time and fall-time estimation of CMOS inverter delay.	07
4.	(a)	Discuss the advantages and disadvantages of CMOS technology in the context of digital integrated circuit design.	03
	(b)	Describe the characteristics of CMOS. Compare CMOS with bipolar technologies.	07

PART-B
Answer any **THREE** questions)

5.	a)	Illustrate the operation of an NMOS inverter with the help of a circuit diagram. Explain the function of each component involved.	03
	b)	Explain the output characteristics of NMOS transistor with graphical representations.	07
6.	a)	What is VLSI Technology and write down the significance of VLSI design.	03
	b)	Briefly describe the photolithography process in IC fabrication.	07
7.	a)	Illustrate the circuit diagram of a BiCMOS NAND gate and explain its operation.	04
	b)	List the fundamental steps involved in the BiCMOS fabrication process.	02
	c)	Draw and explain the VLSI design flow diagram.	04
8.	(a)	Write short notes on the Growth Mechanism of Sio_2.	03
	(b)	Find out the area capacitance of the following simple layer showed in Fig. 8(b) for metal, polysilicon and n-type diffusion.	07

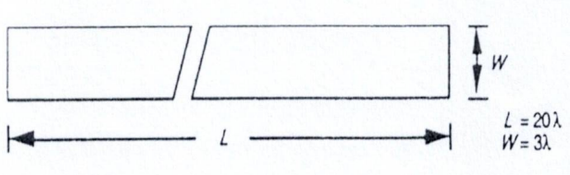

Fig. 8(b)

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Final Examination 2023 — **4th Year 2nd Semester**
Course No: EEE 803 — **Course Title: Power System Protection**
Time: 03 (Three) hours — **Full Marks: 60**

N.B. (i) Answer any **three** questions from each (ii) Use separate answer script for each PART
(iii) Marks allotted are indicated in the margin (iv) You can use pen for drawing any sketch

PART A
(Answer any **THREE** questions)

1. a) In a neat sketch, show the voltage and current waveforms with respect to time during fault clearing. 03

   b) Describe different types of bus-bar arrangements with neat sketch. 04

   c) A 50 Hz, 11 kV, 3-phase alternator with earthed neutral has a reactance of 5 ohms per phase and is connected to a bus-bar through a circuit breaker. The distributed capacitance up to circuit breaker between phase and neutral is 0·01 μF. Determine 03
   (i) peak re-striking voltage across the contacts of the breaker
   (ii) frequency of oscillations
   (iii) the average rate of rise of re-striking voltage up to the first peak

2. a) What is current chopping? Describe using neat sketch. 04

   b) Describe the construction and working principle of SF_6 circuit breaker or Vacuum circuit breaker using a neat sketch. 05

   c) Draw approximate inverse time characteristics of fuse. 01

3. a) Using a diagram, show how a.c. current is cut off by a fuse. What do we mean by prospective current in such cases? 02

   b) Derive the ordinary fuse law. 02

   c) Theoretically derive the universal torque equation for induction type relay. Show how the equation can be applied for non-directional overcurrent relay. 03

   d) Discuss the sequence of events with respect to the following figure. What is your conclusion regarding this scheme? 03

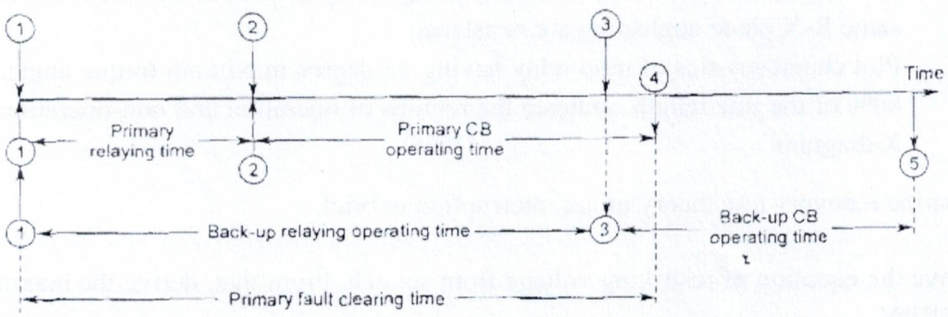

Fig. 3(d)

4. a) A star-connected, 3-phase, 10-MVA, 6·6 kV alternator has a per phase reactance of 10%. It is protected by Merz-Price circulating-current principle which is set to operate for fault currents not less than 175 A. Calculate the value of earthing resistance to be provided in order to ensure that only 10% of the alternator winding remains unprotected. 03

   b) Explain the operation of Buchholz Relay. Also explain advantage and disadvantage of Buchholz Relay. 03+02

   c) Draw a simple current differential scheme for a generating station busbar. 02

PART B

(Answer any **THREE** questions)

5. a) Describe the time-graded overcurrent protection for ring main system. 05

   b) Draw a protection scheme for a 3-phase delta-delta power transformer to protect simultaneously against phase-to-phase fault, phase-to-ground fault and short-circuit between turns on the same phase winding. 03

   c) What is Knee point of CT? Show knee points, operating points of protecting CT and measurement CT in a CT excitation curve. 02

6. a) In the figure 6(a), for the following cases where was the short circuit, was there any failure of relaying, including breakers, and if so what failed? 03

Case	Breakers Tripped
a	4, 5, 8
b	3, 7, 8
c	3, 4, 5, 6

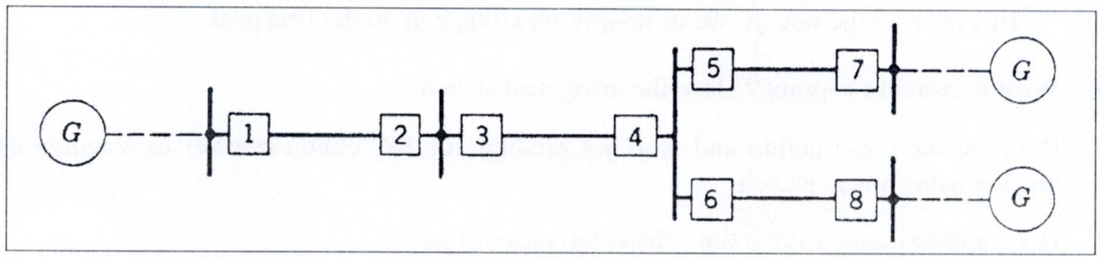

Fig: 6(a): Simple power system with CB positionings

   b) Describe the operation of supervisory relay. 03

   c) "Overcurrent relays are not preferred for distance protection"- justify the statement. 04

7. a) For a particular scheme, given line impedance is 2.5 + j 5.0 ohm. Ratio of the CT and PT to be used are 400/1 and 33,000/110 respectively. 07

   I. Plot line characteristic on R-X plane referred to the secondary side

   II. Plot characteristic of minimum impedance relay to protect 80% of the line length on same R-X plane neglecting arc resistance

   III. Plot characteristics of mho relay having 45 degree maximum torque angle, to protect 80% of the line length, indicate the regions of operation and non-operation on the R-X diagram.

   b) Describe recovery rate theory of arc interruption in brief. 03

8. a) Derive the equation of restriking voltage from scratch. From that, derive the maximum value of RRRV. 3+1

   b) Describe any two opposing forces during CB closing operation. 03

   c) I. What is meant by this rated duty cycle of a CB: **O - 0.3s - CO - 3min - CO** 03

   II. Draw a single shot auto-reclosure in EHV lines