

Reg. No.					

INTERNATIONAL CENTRE FOR APPLIED SCIENCES (Manipal University) II SEMESTER B.S. DEGREE EXAMINATION – NOV. / DEC. 2016 SUBJECT: ELEMENTS OF BIOMEDICAL ENGINEERING (BM121) (BRANCH: BIO-MED) Wednesday, 14 December 2016

Time: 3 Hours

Max. Marks: 100

- ✓ Answer ANY FIVE full Questions.
- ✓ Assume relevant data if missing.
- ✓ Draw diagrams wherever necessary.
- 1. (a) What is the major difference between photodiode and LED? Give the construction, working principle and two applications of LED.
 - (b) What is Junction Field Effect Transistor (JFET)? With a neat diagram, explain its construction details and operation.
 - (c) With a neat diagram, explain the output characteristics of a BJT transistor. List two important applications of BJT. (6+7+7)
- 2. (a) Design a Mod-7 asynchronous counter using JK Flipflops.
 - (b) What is a Flipflop? Give the logic diagram and truth table of a JK Flipflop.
 - (c) Design a 4-bit binary parallel adder.
- 3. (a) What are the problems encountered in measuring a living system? Explain.
 - (b) What are the different roles of biomedical engineer? Explain.
 - (c) Draw a generalized block diagram of man-instrument system and explain each block.

(8+6+6)

(8+6+6)

- 4. (a) Explain the following with reference to biomedical instrumentation:
 - (i) Range
 - (ii) Sensitivity
 - (iii) Hysteresis
 - (b) Draw and explain equivalent circuit of a bio-potential electrode.
 - (c) Draw an op-amp non-inverting amplifier circuit in open loop and closed loop configurations, and derive expression for the gain in each configuration.

(6+6+8)

- 5. (a) Draw and explain op-amp differentiator circuit and sketch its response to a rectangular wave input.
 - (b) Realize an EX-OR gate using minimum number of NOR gates.
 - (c) What is a Multiplexer? Give one biomedical application of a Multiplexer.
 Implement the Boolean function F (A, B, C, D) = ∑ m (0, 3, 5, 7, 8, 10, 14) using 4:1 MUX and additional gates.

(8+4+8)

- 6. (a) How do you make use of op-amp as a subtractor? Illustrate with an example.
 - (b) Explain the following bio-potential recording electrodes:
 - (i) Metal plate electrode
 - (ii) Metal disc electrode
 - (iii) Disposable foam pad electrode
 - (c) What is a Decoder? Write the logic diagram and truth table of a 2 to 4 line decoder with an enable input.

(6+9+5)

- 7. (a) Simplify the Boolean expression using KMap method. $F = \overline{A}\overline{B}\overline{C} + \overline{B}C\overline{D} + \overline{A}BC\overline{D} + A\overline{B}\overline{C}$
 - (b) What is a UJT? Describe its characteristics?
 - (c) Draw the circuit of an op-amp inverting amplifier and compute the gain if $R_F = 3K\Omega$, and $R_G = 8.6K\Omega$.

(8+8+4)

- 8. (a) With a neat diagram, describe how a NPN transistor is biased. List two important applications of BJT.
 - (b) What is half-cell potential and half-cell? Explain.
 - (c) What are the different waves present in an EEG signal? Write the frequency range of the EEG waves.

(8+6+6)