

M.Sc. MEDICAL PHYSICS
SEMESTER -II EXAMINATION, JUNE-2026

(MPCC202) ELECTRONICS AND INSTRUMENTATION

[Time allotted: Three Hours]

[Max Marks: 100]

Note: Read all the instructions carefully

Answer all questions in serial order, Draw suitable diagrams wherever necessary

Q. 1. Objective type questions: (Attempt All)

(10 x 02 = 20)

(Very short/ Short answer/ MCQ/ One liners/ Fill in the blanks/ True/False)

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| <p>a. A cold cathode tube is generally used as a (PO4, CO1)</p> <ol style="list-style-type: none"> i. Diode ii. Triode iii. Tetrode iv. Pentode <p>b. The most common unit of work function of metals is (PO4, CO1)</p> <ol style="list-style-type: none"> i. Joules ii. Electron –volt iii. Volt iv. Kilovolt <p>c. Conduction in a hot cathode tube is started by Emission. (PO4, CO1)</p> <ol style="list-style-type: none"> i. Thermionic ii. Secondary iii. Natural sources iv. None of these <p>d. The barrier voltage at PN junction for silicon is about (PO4, CO2)</p> <ol style="list-style-type: none"> i. 3.5 V ii. 3 V iii. 0.3 V iv. 0.7 V <p>e. The biasing in a CE transistor represents conditions. (PO4, CO3)</p> <ol style="list-style-type: none"> i. Ac ii. Dc iii. Both iv. None of these | <p>f. The value of negative feedback ratio is always..... (PO4, CO3)</p> <ol style="list-style-type: none"> i. 0 to 1 ii. 1 to 100 iii. 1 iv. >100 <p>g. A MOSFET has three terminals, namely (PO5, CO3)</p> <ol style="list-style-type: none"> i. Cathode, anode and grid ii. Emitter, base and collector iii. Source, gate and drain iv. None of the above <p>h. Which of the following operations cannot be performed using OP-amp? (PO5, CO4)</p> <ol style="list-style-type: none"> i. Addition ii. Subtraction iii. Integration iv. Multiplication <p>i. When an input signal 0 is applied to a NOT gate, the output is (PO5, CO5)</p> <ol style="list-style-type: none"> i. 0 ii. 1 iii. Either 0 or 1 iv. None of these <p>j. Which of the following is a combinational gate? (PO5, CO5)</p> <ol style="list-style-type: none"> i. AND ii. OR iii. NOT iv. NAND |
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Q. 2. Short notes/ Short answer type questions (Attempt any Five)

(05 x 04 = 20)

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| <p>a. Explain various types of electron emission processes.</p> <p>b. Distinguish between cold cathode and hot cathode gas-filled tube.</p> <p>c. Explain the creation of barrier potential in a semiconductor diode?</p> <p>d. Discuss the concept of hole current in semiconductors.</p> <p>e. What do you understand by majority and minority carriers?</p> <p>f. What do you understand by a differential amplifier?</p> <p>g. Discuss the concept of negative feedback in amplifiers.</p> | <p>(PO4, CO1)</p> <p>(PO4, CO1)</p> <p>(PO4, CO2)</p> <p>(PO4, CO2)</p> <p>(PO4, CO2)</p> <p>(PO5, CO4)</p> <p>(PO4, CO2)</p> |
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Q. 3. Structured questions (Attempt any Three)

(03 x 10 = 30)

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| <p>a. What are the key properties of a thermionic emitter? Discuss the properties of commonly used thermionic emitters, such as tungsten, thoriated tungsten, and oxide-coated cathodes.</p> <p>b. Discuss the phenomenon of the formation of depletion layer in a semiconductor.</p> <p>c. Discuss the shortcomings of bipolar transistors? How are these shortcomings overcome by field effect transistors?</p> <p>d. What do you understand by an exclusive OR gate? Explain with their electrical circuit, symbol and truth tables.</p> | <p>(PO4, CO1)</p> <p>(PO4, CO2)</p> <p>(PO4, CO3)</p> <p>(PO5, CO5)</p> |
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Q. 4. Long Answer/ Essay type questions (Attempt any Two)

(02 x 15 = 30)

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| <p>a. Discuss the construction and working principle of a hot cathode gas diode. Explain its characteristic curve. How it is different from cold cathode tube?</p> <p>b. Discuss forward and reverse biasing of a junction diode with the help of circuit diagrams and characteristic curves. Explain the terms breakdown voltage and knee voltage. Discuss the limitations in the operating conditions of a PN junction.</p> <p>c. Explain the construction and working principle of a p-channel JFET. Describe its output characteristics with suitable diagrams.</p> | <p>(PO4, CO1)</p> <p>(PO4, CO2)</p> <p>(PO4, CO3)</p> |
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