

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S7 (Hons.) Examination November 2025 (2022 Admn)

Course Code: ECT495

Course Name: RF MEMS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks.

Marks

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| 1 | Justify the significance of Surface Micromachining and Bulk Micro Micromachining | (3) |
| 2 | Explain the role of compliance and mechanical impedance in determining the dynamic behaviour of the moving plate of an electrostatic micro actuator. | (3) |
| 3 | Enumerate the parameters to be considered in the design of RF switches. | (3) |
| 4 | Define the selection criteria for a switch used in RF applications. Give typical applications of RF switches. | (3) |
| 5 | Explain how the inductance of micro-machined inductors can be varied. | (3) |
| 6 | Elaborate on how the capacitance is varied in micromachined capacitors. | (3) |
| 7 | Discuss how insertion loss affects filter performance and quality factor. | (3) |
| 8 | Explain one practical application of a phase shifter. | (3) |
| 9 | Give some examples of patch geometries used for microstrip antennas. | (3) |
| 10 | What are the functions of MEMS packages? | (3) |

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

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|----|---|------|
| 11 | a) What are actuators? Using appropriate figures explain any two actuation mechanisms used in MEMS. | (10) |
| | b) How is etching done in the manufacturing of MEMS devices? How can it be controlled? | (4) |

OR

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| 12 | a) Using appropriate diagrams, explain the development of the equivalent circuit of a piezoelectric transducer. | (7) |
| | b) Using examples, list the major classification of MEMS materials and explain the sputtering process in detail. | (7) |

Module II

- 13 a) Illustrate and explain the working of a DC contact MEMS switch. (7)
- b) Using appropriate equations, explain up-state capacitance, down-state capacitance, and capacitance ratio in MEMS shunt switches. (7)

OR

- 14 a) With neat sketches explain the construction and working of a capacitive membrane shunt type RF MEMS switch. (10)
- b) Compare and contrast series and shunt RF MEMS switches. (4)

Module III

- 15 a) Discuss the possible geometries of planar inductive elements for RF applications and how they affect the quality factor and inductance. (10)
- b) What are the important considerations in the design of planar inductors? (4)

OR

- 16 a) Explain why area tuning is preferred over gap tuning in MEMS capacitors, with diagrams. (8)
- b) What are the key parameters for the design of inductors? (6)

Module IV

- 17 a) With a necessary diagram, explain flexural disk resonators. (7)
- b) Discuss the design of any one type of micromechanical filter. (7)

OR

- 18 a) With diagrams, explain the different types of semiconductor phase shifters. (10)
- b) Elaborate on the surface acoustic wave filter operation. (4)

Module V

- 19 a) Illustrate and explain the typical feed configurations used in microstrip antennas (10)
- b) Demonstrate the significance of Multichip module (MCM) packaging. (4)

OR

- 20 a) Using appropriate assumptions, design the parameters of microstrip antenna. (7)
- b) How can MEMS packages be categorized? Summarize. (7)
