BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: M.Tech. + Pre-PhD **SEMESTER: SP-22**

BRANCH: ECE **SESSION: SP/22**

SUBJECT: EC550 Microwave ad MM-wave Integrated Circuits and Applications

TIME:02 Hrs **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a)	Compare and contrast MMIC over HMIC.	[2]
Q.1(b)	List out the key active device technologies that are used for RFIC technology and MMIC technology and identify the various circuit design approaches	[3]
Q.1(c)	Describe in details III-V HBT microstrip MMIC fabrication technology with a neat schematic diagram.	[5]
Q.2(a)	Identify the transmission lines for uniplanar MMICs along with their structure and with both E-field and H-field distribution.	[2]
Q.2(b)	Discuss microstrip transmission line major discontinuities along with their respective equivalent circuit.	[3]
Q.2(c)	Deduce the expression for coupling factor, directivity and isolation of a directional coupler using odd-even mode analysis of parallel coupled transmission lines.	[5]
Q.3(a)	Draw schematic diagram matching networks and DC bias networks used for amplifier design.	[2]
Q.3(b)	Illustrate the microstrip form of lange coupler, branch line coupler, rat race coupler and Wilkinson power splitter with exact length and impedance of the associated transmission line sections.	[3]
Q.3(c)	Compare construction, principle of operation with most preferred applications of the following transistor technologies MESFETS, HEMT and HBT	[5]
Q.4(a)	Compare and contrast the gain, noise, power handling and linearity capabilities of bipolar and field effect devices.	[2]
Q.4(b)	Analyse an MMIC Voltage Controlled Oscillator using the design approaches of a generic FET oscillator topology	[3]
Q.4(c)	Write notes on low noise Mm-wave amplifier	[5]
Q.5(a)	State the advantages of probe station-based measurements of MMIC devices over test fixture-based measurements.	[2]
Q.5(b)	Describe the techniques used for non-invasive MMIC measurement and its usefulness.	[3]
Q.5(c)	Write salient features of thermal and cryogenic measurements of MMIC designs.	[5]

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