University School of Automation and Robotics
GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY
East Delhi Campus, Surajmal Vihar
Delhi - 110092

Paper Code: ARI 207	**L**	**T/P**	**Credits**
Subject: Analog Electronics	4	-	4

Marking Scheme

1. Teachers Continuous Evaluation: 25 Marks
2. End Term Theory Examination: 75 Marks

INSTRUCTIONS TO PAPER SETTERS: **Maximum Marks : 75**

1. There should be 9 questions in the end term examination question paper
2. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 15 marks.
3. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 15 marks.
4. The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
5. The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes:

CO1:	Ability of students to implement fundamental principles of analog electronics.
CO2:	Ability of students to implement sufficient basic knowledge to design diodes and transistor based circuits, op-amps and their applications.
CO3:	Ability of students to design and analyze various analog electronic circuits
CO4:	Ability of students to be able to utilize basic electronic devices such as diodes, BJT, FET transistors and multi-vibration circuits

Course Outcomes (CO) to Programme Outcomes (PO) Mapping (Scale 1: Low, 2: Medium, 3: High

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	3	2	2	3	1	1	1	3
CO2	3	3	3	3	3	1	2	3	2	1	1	3
CO3	3	3	3	3	3	1	3	3	3	2	2	3
CO4	3	3	3	3	3	3	3	3	3	2	2	3

Unit I **[12]**

Introduction: Review of semi-conductor Physics, Open-circuited p-n junction, Diode equation, PN diode as a rectifier (forward bias and reverse bias), wave shaping circuits, General idea about different wave shapers, RC and RL integrating and differentiating circuits with their applications, Diode clipping and clamping circuits and simple numerical problem on the circuits Clipper

Review of diode and BJT: Bias stabilization: Need for stabilization, fixed Bias, emitter bias, self-bias, bias stability with respect to variations in I_{co}, V_{BE} & β, Stabilization factors, thermal stability. Bias compensation techniques. Small signal amplifiers: CB, CE, CC configurations, hybrid model for transistor at low frequencies, RC coupled amplifiers, mid band model, gain & impedance, comparisons of different configurations, Emitter follower, Darlington pair(derive voltage gain, current gain, input and output impedance), Hybrid-model at high frequencies (π model).

Unit II **[12]**

Amplifiers and Oscillators: Small signal low frequency transistor amplifier circuits: h-parameter representation of a transistor, Analysis of single stage transistor amplifier using h-

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parameters: voltage gain, current gain, Input impedance and Output impedance.
Feedback Amplifiers: Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.
Power Amplifiers: Power dissipation in transistors, difference with voltage amplifiers, Amplifier classification (Class A, Class B, Class C, Class AB) class AB push pull amplifier, collector efficiency of each, and cross over distortion.

Unit III [6]
Field Effect Transistor: Introduction, Classification, FET characteristics, Operating point, Biasing, FET small signal Model, JFET characteristics (Qualitative and Quantitative discussion), Small signal model of JFET, MOSFET, MESFET and its characteristics (Enhancement and depletion mode), Comparison of various Transistors, Introduction to SCR and UJT.

Unit IV [6]
Operational Amplifiers: Ideal op-amp, Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product, Inverting and non-inverting amplifier, Differentiator, integrator, Square-wave and triangular-wave generators.
Multivibration Circuits: working principle of transistor as switch, Concept of multi-vibrator: astable, monostable, and bistable and their applications, Block diagram of IC555 and its working, IC555 as monostable and astable multi-vibrator.

Text Books:

1. J.Millman, C.C.Halkias, and Satyabratha Jit (2007). *Electronic Devices and Circuits*. Tata McGraw Hill, 2nd Edition.
2. Salivahanan and others. (2011) *Electronic Devices and Circuits*. Tata McGraw Hill
3. D. R. Cheruku and B. T. Krishna (2008). *Electronic Devices and Circuits*. Pearson

References:

1. T.F. Bogart Jr., J.S.Beasley and G.Rico (2004). *Electronic Devices and Circuits*. Pearson Education, 6th edition.
2. S.G.Burns and P.R.Bond (1998). *Principles of Electronic Circuits*. Galgotia Publications, 2nd Edition.
3. Millman and Grabel (1988). *Microelectronics*. Tata McGraw Hill
4. R. L. Boylestad and L. Nashlesky (2009). *Electronic Devices and Circuit Theory*. Pearson, 10th Edition.

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