

**SCHEME OF EXAMINATION**  
**&**  
**SYLLABUS (IIIrd & IVth SEM.)**  
**for**  
**ECE DEPARTMENT**

**BACHELOR OF TECHNOLOGY (IGDTUW)**  
**(Electronics & Communication Engineering)**  
**(Teaching and Examination Scheme)**

**THIRD SEMESTER**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
<b>THEORY PAPERS</b>						
1	BAS 201	Numerical Methods	4	-	4	Basic Science
2	BEC 203	Signal & Systems	4	-	4	Departmental Core
3	BEC 205	Network Analysis and Synthesis	4	-	4	Departmental Core
4	BEC 207	Analog Electronics – I	4	-	4	Departmental Core
5	BIT 209	Object Oriented Programming	4	-	4	Engineering Science
<b>PRACTICAL/VIVA VOCE</b>						
1	BAS 251	Numerical Methods Lab	0	2	1	Basic Science
2	BEC 253	Signal & Systems Lab	0	2	1	Departmental Core
3	BEC 255	Network Analysis and Synthesis Lab	0	2	1	Departmental Core
4	BEC 257	Analog Electronics – I Lab	0	2	1	Departmental Core
5	BIT 259	Object Oriented Programming (using C++ & JAVA) Lab	0	2	1	Engineering Science
		<b>TOTAL</b>	<b>20</b>	<b>10</b>	<b>25</b>	

**FOURTH SEMESTER**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
<b>THEORY PAPERS</b>						
1	BEC 202	Analog Electronics – II	4	-	4	Departmental Core
2	BEC 204	Digital Circuits & Systems	4	-	4	Departmental Core
3	BEC 206	Communication Systems	4	-	4	Departmental Core
4	**BCS 208	Data Structures Using C++	4	-	4	Departmental Core
5	BEC 210	Transmission Lines and Antennas	4	-	4	Departmental Core
<b>PRACTICAL/VIVA VOCE</b>						
1	BEC 252	Analog Electronics – II Lab	0	2	1	Departmental Core
2	BEC 254	Digital Circuits & Systems Lab.	0	2	1	Departmental Core
3	BEC 256	Communication Systems Lab.	0	2	1	Departmental Core
4	BEC 258	Mini Project	0	2	1	Departmental Core
5	**BCS 260	Data Structure Using C++ Lab	0	2	1	Departmental Core
		<b>TOTAL</b>	<b>20</b>	<b>10</b>	<b>25</b>	

**\*\*Proposed to be included w.e.f. January 2016 in place of Probability and Stochastic Processes/Simulation Lab**

**BACHELOR OF TECHNOLOGY (IGDTUW)**  
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**FIFTH SEMESTER EXAMINATION**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
<b>THEORY PAPERS</b>						
1	BEC 301	Digital Systems Design & VHDL	4	-	4	Departmental Core
2	BEC 303	Advanced Communication Systems	4	-	4	Departmental Core
3	BCS 305	Microprocessors & Microcontrollers	4	-	4	Engineering Science
4	BEC 307	Control Engineering	4	-	4	Departmental Core
5	BEC 309	Electronic Measurement & Instrumentation	4	-	4	Departmental Core
6	BAS 311	Human Values & Professional Ethics	3	-	3	Humanities & Social Sciences
<b>PRACTICAL/VIVA VOCE</b>						
1	BEC 351	Digital Systems Design Lab	0	2	1	Departmental Core
2	BEC 353	Advanced Communication Systems Lab	0	2	1	Departmental Core
3	BCS 355	Microprocessors & Microcontrollers Lab	0	2	1	Engineering Science
4	BEC 357	Control Engineering Lab	0	2	1	Departmental Core
5	BEC 359	Electronic Measurement & Instrumentation Lab	0	2	1	Departmental Core
		<b>TOTAL</b>	<b>23</b>	<b>10</b>	<b>28</b>	

**BACHELOR OF TECHNOLOGY (IGDTUW)**  
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**SIXTH SEMESTER EXAMINATION**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
<b>THEORY PAPERS</b>						
1	BEC 302	Microwave & Radar Engineering	4	-	4	Departmental Core
2	BEC 304	Information Theory & Coding	4	-	4	Departmental Core
3	BEC 306	VLSI Design	4	-	4	Departmental Core
4	**BIT 308	Data Communication & Networking	4	-	4	Departmental Core
5	BEC 310	Digital Signal Processing and its applications	4	-	4	Departmental Core
6	BAS 312	Engineering Economics	3	-	3	Humanities & Social Sciences
<b>PRACTICAL/VIVA VOCE</b>						
1	BEC 352	Microwave & Radar Engineering Lab	0	2	1	Departmental Core
2	BEC 354	Information Theory & Coding Lab	0	2	1	Departmental Core
3	BEC 356	VLSI Design Lab	0	2	1	Departmental Core
4	**BIT 358	Data Communication & Networking Lab	0	2	1	Departmental Core
5	BEC 360	Digital Signal Processing and its applications Lab	0	2	1	Departmental Core
		<b>TOTAL</b>	<b>23</b>	<b>10</b>	<b>28</b>	

**NOTE:** 4-6 weeks training will be held after sixth semester. However, Viva-Voce will be conducted in the seventh semester.

**\*\* Proposed to be included w.e.f. January 2016 in place of Fundamentals of Operating Systems/ Fundamentals of Operating Systems Lab**

**BACHELOR OF TECHNOLOGY (IGDTUW)**  
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**SEVENTH SEMESTER EXAMINATION**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BEC 401	Wireless Communication	4	-	4	Departmental Core
2	BEC 405	Optical Communication	4	-	4	Departmental Core
ELECTIVES- I (Choose Any One)						
1.	BCS 403	Mobile Computing	4	-	4	Departmental Elective
2.	BEC 411	VLSI Technology				
3.	BCS 409	Soft Computing				
4.	BMA 407	Non Conventional Energy Resources				
5.	BEC 413	Open Elective “New and Emerging Technologies in Electronics Engineering.”				
6.	BIT 421	Cloud Computing & applications				
7.	BEC-423	Advanced Antenna Technology				
ELECTIVES-II (Choose Any One)						
1	BMA 417	Process Improvement Techniques	3	-	3	Humanities & Social Sciences/ Department of IT & MAE
2	BAS 419	Financial Accounting				
3	BIT 415	Cyber Security Awareness				
PRACTICAL/VIVA VOCE						
1	BEC 451	Wireless Communication Lab	0	2	1	Departmental Core
2	BEC 453	Optical Communication Lab	0	2	1	Departmental Core
3	BEC 455	Practical based on Elective-I	0	2	1	Departmental Elective
4	BEC 457	*Minor Project	0	8	4	Departmental Core
5	BEC 459	Practical Training	-	-	2	Departmental Core
6	BAS 461	Disaster Management	0	2	1	Humanities & Social Sciences
		TOTAL	15	16	25	

\*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

**BACHELOR OF TECHNOLOGY (IGDTUW)**  
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**EIGHTH SEMESTER EXAMINATION**

Sl. No.	Paper Code	Paper Title	L	P	Credits	Course Category
THEORY PAPERS						
1	BCS 402	Embedded Systems Design	4	-	4	Departmental Core
2	BEC 404	Mobile Communication	4	-	4	Departmental Core
ELECTIVES-I (Choose Any One)						
1	BEC 406	Power Electronics	4		4	Departmental Elective
2	BEC 408	Advanced VLSI Design				
3	BEC 410	Digital Image Processing				
4.	BCS 412	Wireless Sensor Networks				
5.	BEC 414	Open Elective “New and Emerging Technologies in Communications & Signal Processing”				
	ELECTIVES_II (Choose any one)					
1	BAS 420	Business Entrepreneurship	3	-	3	Humanities & Social Sciences
2	BAS 422	Organizational Behavior				
	PRACTICAL/VIVA VOCE					
1	BCS 452	Embedded System Design Lab	0	2	1	Departmental Core
2	BEC 454	Mobile Communication Lab	0	2	1	Departmental Core
3	BEC 456	*Major Project	0	12	8	Departmental Core
		TOTAL	15	16	25	
GRAND TOTAL					212	

\*The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format. The student will have to present the progress of the work through seminars and progress reports.

**NOTE:**

- 1. The total number of the credits of the B.Tech. Programme = 212**
- 2. Each student shall be required to appear for examinations in all courses. However, for the award of the degree a student shall be required to earn the minimum of 204 credits.**

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

1. 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 20 marks.
2. 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 of 10 marks.

**UNIT I**

**Floating-Point Numbers:** Floating-point representation, Rounding, Chopping, Error analysis, Condition and instability, rate and order of convergence of iterative schemes.

**Non-Linear Equations:** Direct iteration method, Bisection, Secant, Regula-Falsi method and Newton-Raphson method for single variable, convergence analysis of Newton's and Secant method, simultaneous nonlinear equations with two variables-Newton-Raphson method. **[10H]**

**UNIT II**

**System of Linear equations :** Gauss-elimination method (using Pivoting strategies), Gauss-Jacobi and Gauss-Seidel Iteration method. Power and Jacobi method for eigen-values and eigen-vectors.

Interpolation: Difference operators, Finite differences, Newton's, Stirling's and Bessel's interpolation formula **[10H]**

**UNIT III**

Gauss interpolation method, Lagrange interpolation and Newton's divided difference interpolation formula with error analysis.

Numerical differentiation and integration, Newton-Cotes quadrature formulae (with error) and Gauss - Legendre quadrature formulae, Trapezoidal, Simpson's one-third and three-eighth rule. **[10H]**

**UNIT IV**

**Differential Equations:** Solution of initial value problems using Euler's, modified Euler's, Runge-Kutta method for first and second order differential equations. Milne's and Adam's Bashforth predictor-corrector methods. **[10H]**

**Text Books:**

1. Jain M.K., Iyengar, S.R.K., and Jain, R.K. Numerical Methods for Scientific and Engineering Computation, New Age International, 2003.
2. Gerald C.F and Wheatley P.O., Applied Numerical Analysis, Pearson Education. 2011, Eighth Edition.
3. Grewal B. S., Numerical Methods in Engineering and Science, Khanna Publishers.

**References Books :**

1. Sastry S., Introductory Methods of Numerical Analysis, PHI Pvt. Ltd., 2012, Fifth Edition.
2. Conte, S.D and Carl D. Boor, Elementry Numerical Analysis: An Algorithmic approach, Tata McGraw Hill, New York, 2005.
3. Jain R.K., Iyengar S. R. K., Advanced Engineering Mathematics, Narosa Publishing House, 2011, Third Edition.

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

1. 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 20 marks.
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**UNIT – I**

**Introduction:** Continuous and Discrete – Time Signals & their Classification, Continuous & Discrete–Time system & their properties. Linear Time Invariant Systems, properties of LTI systems, State variable Description for LTI systems, Convolution for Continuous- time systems (CTS), convolution for Discrete-time systems (DTS), Correlation of DTS. [10H]

**UNIT – II**

**Fourier analysis for CTS:** Importance of Frequency Domain Analysis, Response of LTI systems to Exponential Signals, Periodic signals and properties, Fourier Transform (FT) its Properties, system analysis of LTI system using FT

**Fourier analysis for DTS:** Response of LTI system to Exponentials Signals and its properties (DFS) Discrete Time Fourier transform (DTFT) & its properties system Analysis using DTFT

[10H]

**UNIT – III**

**Time and Frequency Characterization of Signals and Systems:** The Magnitude Phase Representation of the Fourier Transform, Classification of Linear and Non Linear phase, Phase Delay and Group Delay. Min Phase system, Max phase system, All pass system.

**Sampling:** The sampling Theorem, Effect of under sampling, aliasing, interpolation, signal reconstruction using zero order hold system, Sample and Hold circuit, Practical Applications of Sampling - Digital Audio, Digital Video, A/D Conversion of Physical Signals.

[10H]

**UNIT – IV**

**Z- Transform:** Definitions and Properties, Significance and properties of ROC, Inversion of Z-Transform using partial fractions and residue theorem, Application of Z-transform for LTI system, Introduction to Engineering Applications of Z-Transform - Digital Filters, Servo Motor Control

[10H]

**Text Books**

- 1) A.V.Oppenheim, AS.Willsky and S.Hamid Nawab, “Signal Systems”,PHI, 1997.
- 2) JG.Proakis and DG.Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, 4th edn,Pearson, 2009

**Reference Books**

- 1) S. Haykin and B. Van Veen, “Signals and Systems”, John Wiley, 1999
- 2) A. Anand Kumar, “Signal and System”,PHI, 2011.
- 3) <http://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/>



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2. 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 of 10 marks.

**UNIT – I**

Voltage, Current, Power and Energy, Circuit Elements(R,L,C), Independent and Dependent Sources, Kirchhoff's Laws, Series and Parallel Combinations of Elements, Voltage Division and Current Division, Node Analysis, Mesh Analysis, Three Phase Networks, Star/Delta Connection, Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Source Transformations, Maximum Power Transfer Theorem, Compensation Theorem, Reciprocity Theorem, Millman's Theorem, Telegen's Theorem.

**[10 H]**

**UNIT – II**

Time domain response of First order RL and RC circuits, Time domain response of Second order linear circuits, Circuit Analysis by Laplace Transform, Graph theory and its application.

**[10 H]**

**UNIT - III**

Two- Port Three Terminal Networks, Equations of Two-Port Networks, Z and Y Parameters, Hybrid and Transmission Parameters, Inverse Hybrid and Inverse Transmission Parameters , Relationship Between Two-Port Parameters, Inter-connection of Two-Port Networks– Lattice Networks.

**[10 H]**

**UNIT - IV**

Poles and Zeros, Network functions for the one port and two port, Poles and zeros of network functions, Restrictions on pole and zero locations for driving point functions and transfer functions, Time domain behavior from the pole zero plot, Positive real function and its properties, properties of LC, RC and RL driving point functions– synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

**[10 H]**

**Text Books:**

1. W. Hayt, J.E.Kemmerley and S. M. Durbin, "Engineering circuit Analysis", Tata McGraw-Hill, Sixth Edition, Reprint, 2008.
2. M.E.VanValkenburg, "Network Analysis", Prentice-Hall, Third Edition, 1974.
3. V. K. Aatre, "Network Theory and Filter Design", John Wiley & Sons, Second Edition, 1987.

**Reference Books:**

1. J. A. Edminister, "Theory and Problems of Electric Circuits", Schaum's Outline Series, McGraw-Hill Book Company, Fourth Edition, 2003.
2. R. C. Dorf & J. A. Svoboda, "Introduction to Electric Circuits", John Wiley & Sons, Eighth Edition, 2010.
3. Sudhakar. A and ShyammoohanS.Palli, "Circuits and Networks Analysis and Synthesis", Tata McGraw- Hill Publishing Company Limited, Third Edition, 2008.
4. <https://class.coursera.org/circuits-003/wiki/Syllabus>

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

1. 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 20 marks.
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**UNIT – I**

**Bipolar junction transistor:** Introduction and types of Transistors, construction, BJT characteristics in CB, CE & CC mode, operating point, AC/DC Load Line, leakage currents, saturation and cut off mode of operations, Ebers-moll model.

**Bias stabilization:** Need for stabilization, various biasing schemes, bias stability with respect to variations in  $I_{CO}$ ,  $V_{BE}$  &  $\beta$ , Stabilization factors, thermal stability.

**Models:** Low Frequency Models for transistor (h-parameter, Hybrid –  $\Pi$ ,  $r_{\Pi}$ )

[10H]

**UNIT – II**

**BJT amplifiers:** Analysis at low frequency (CB, CE, CC & CE with  $R_E$ ), Comparison of different types of configurations, Cascaded Amplifiers, Darlington pair, Cascode amplifiers

**High Frequency response of Amplifier:** Hybrid- $\Pi$  Model at High Frequency, CE Short circuit current gain  $f_T$ , Current gain with resistive load.

**Multistage Amplifiers:** Methods of Coupling, RC coupled amplifier, Frequency Response analysis (Low, Mid & High), Calculation of gain bandwidth.

[10H]

**UNIT – III**

**Feedback Amplifiers:** Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Overall Gain using Feedback, Impedance considerations in different Configurations, Examples of analysis of feedback Amplifiers.

**Special Semiconductor Devices:** SCR( Operation, Characteristics & applications), Thyristors, TRIAC, DIAC, Unijunction Transistor(UJT), UJT Relaxation Oscillator.

[10H]

**UNIT – IV**

**Field Effect Transistor:** Classification, JFET characteristics, Operating point, various type of Biasing, Enhancement & Depletion type MOSFETs. JFET Model, JFET Amplifier analysis ( CD, CS & CG), CMOS, MISFET, MESFET VFET.

[10H]

**Text Books**

1. Millman and Halkias, “Electronic devices and circuits” TMH, 1999.
2. Salivahanan, Suresh Kumar, Vallavaraj, “Electronic devices and circuits”TMH, 1999
3. Balbir Kumar and S. B. Jain, “Electronic Devices and Circuits” PHI, 2012.

**Reference Book**

1. J. Millman and Halkias, “Integrated Electronics, Analog & Digital Circuits & Systems” TMH – 2000.
2. Boylestad & Nashelsky, “Electronic Devices & Circuit Theory” PHI – Vth Edition.
3. Sedra & Smith, “Micro Electronic Circuits” Oxford University Press, 6<sup>th</sup> Edition.

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

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**UNIT I**

**Introduction:** Need for Object Oriented Programming, Comparison of Programming paradigms, Characteristics of Object-Oriented Programming Languages, Introduction to Object Oriented concepts (classes, objects, encapsulation, inheritance, data hiding, abstraction, polymorphism), Overview and characteristics of C++ , Fundamentals Data Types & Literals Variables, Arrays, Operators, Control of Flow in OOP, Compilation and Execution Process in C++, Reference vs. Pointer variable.

**Classes and Objects:** C++ & Java class declaration, Role of private, public and protected access specifiers, Memory organization of class, inline function, friend function, static members , constructor and destructors, instantiation of objects, default parameter value, object types, C++ garbage collection, dynamic memory allocation, new and delete operator. **[10H]**

**UNIT-II**

**Polymorphism in C++:** Function overloading, Constructor overloading, Compile time polymorphism, Overloading Rules, Operator Overloading (Unary and Binary) as member function/friend function.

**Inheritance in C++:** Inheritance, Types of Inheritance, Use of protected access specifier, Virtual base class, Ambiguity resolution using scope resolution operator and Virtual base class, Overriding inheritance methods, Constructors and Destructor in derived classes. Runtime polymorphism, Pointer to objects, Virtual Functions (concept of virtual table), pure virtual functions, Abstract Class.

**[10H]**

**UNIT-III**

**Managing Input / Output in C++:** Concept of streams, console I/O – formatted and unformatted, Manipulators, File I/O – Predefined classes, file opening & closing, file manipulation, read & write operations, sequential and random file access.

**Exception Handling in C++:** Basic mechanism, Throwing, Catching and Re-throwing.

**Namespace:** Basic concept, role of scope resolution operator and using keyword.

**[10H]**

**UNIT-IV**

**Introduction to Java-** Overview and characteristics of Java, Data types, Organization of the Java Virtual Machine, Compilation and Execution Process in java, Classes: String and String Buffer classes, Wrapper classes, using super keyword, Multilevel hierarchy abstract and final classes, Object class, Packages and interfaces, Access protection, Exception Handling: Fundamentals exception types, uncaught exceptions, throw, throws, final, built in exception, creating your own exceptions, Multithreaded Programming: Fundamentals, Java thread model: priorities, synchronization, thread classes, Runnable interface, inter thread Communication, suspending, resuming and stopping threads. **[10H]**

**Text Books:**

1. E. Balaguruswamy, “Object Oriented Programming with C++”, 4<sup>th</sup> Edition, TMH.
2. Bjarne Stroustrup , “The C++ Programming Language”, Addison Welsley, 3<sup>rd</sup> Ed
3. Patrick Naughton and Herbertz Schildt , “Java-2: The Complete Reference”, TMH

**References:**

1. D . Parsons, “Object Oriented Programming with C++”, BPB Publication.
2. Steven C. Lawlor, “The Art of Programming Computer Science with C++”, Vikas Publication.
3. Schildt Herbert, “C++: The Complete Reference”, Tata McGraw Hill, 4th Ed., 1999.
4. Behrouz A. Forouan, Richrad F. Gilberg, Computer Science - A Structural Approach Using C++”, Cengage Learning, 2004.
5. R. Nageswara Rao/kogent Solutions,” Core Java: An Integrated Approach: Covers Concepts, programs and Interview Questions”, 2008
6. Decker & Hirshfield, “Programming Java: A introduction to programming using JAVA”, Vikas Publication, 2000.

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

- 1. 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 20 marks.**
- 2. 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 of 10 marks.**

**UNIT – I**

**Introduction to Op-Amp:** Op-Amp models(Ideal & Practical), Inverting & Non-Inverting Amplifier analysis, Op-Amp internal circuit, Differential Amplifier, Transfer Characteristics,  $A_{DM}$ ,  $A_{CM}$ , CMRR, Current Mirror, Active Load, Level Shifter, Output Stages, 741 Op-Amp.

**Op-Amp Characteristics :** DC/AC Characteristics, compensating techniques, slew rate, Op-Amp Data Sheet. [10H]

**UNIT – II**

**Op-Amp Applications:** Adder, Subtractor, Integrator, Differentiator, Voltage-to-Current converter, Current-to-Voltage Converter, Current Amplifier, Instrument amplifier.

**Linear & Non-Linear Applications:** Sine wave generation (Barkhausen Criterion, Phase shift, Wein bridge, Hartley & Colpitts oscillator). Clipping & Clamping circuit, Comparator, Schmitt Trigger, Astable, Monostable, Triangular, Ramp Generator, Log/Antilog circuits using Op-Amp, Precision Rectifier. [10H]

**UNIT – III**

**OTA & its Applications :** Basic structure and functioning, OTA as Differentiator, Integrator, (OTA)-C Filter, (OTA)-C Oscillator, OTA as Voltage Amplifier, Programmable Resistor & OTA as a Filter.

**Power Amplifiers:** Classification of amplifier, analysis of class A,B and AB Amplifiers, push pull amplifier, complementary symmetry amplifiers, conversion efficiency, cross over distortion, power distortion, heat sinks, Tuned amplifiers, Power BJT, IC power amplifiers, MOS power transistors.

[10H]

**UNIT – IV**

**Active RC Filters:** Idealistic & Realistic response of filters (LP, BP, HP), Butter worth & Chebyshev approximation filter functions, All pass, Notch Filter, Quadrature Filter.

**IC PLL:** Operating principle, Monolithic PLL ICs, PLL Applications.

**IC 555 Timer:** Internal operation and its applications as Astable and Monostable Multivibrator. [10 H]

**Text Books**

1. R. A. Gayakward, “Op-amps and Linear Integrated Circuit” PHI – 3<sup>rd</sup> Edition.
2. D. Roychaudhary, S. B. Jain, “Linear Integrated Circuits” New Age International – 2000.

**Reference Books**

1. Sedra Smith, “Microelectronics Circuit” Oxford University Press, 4<sup>th</sup> Edition.
2. J. B. Gupta, “Electronic Devices & Circuits” S. K. Kataria – 2<sup>nd</sup> Edition.

**INSTRUCTIONS TO PAPER SETTERS:**

**Maximum Marks :60**

1. 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 20 marks.
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**UNIT – I**

**Analog & Digital signals,** AND, OR, NOT, NAND, NOR & XOR gates, Boolean algebra. Standard representation of Logical functions, K-map representation and simplification of logical functions, Don't care conditions, X-OR & X-NOR simplification of K-maps.

**Combinational circuits:** Multiplexers, demultiplexers, Decoders & Encoders, Adders & Subtractor, Code Converters, comparators, decoder/ drivers for display devices

**[10 H]**

**UNIT – II**

**Flip Flops:** S-R, J-K, D & T Flip-flops, excitation table of a flip-flop, race around condition.

**Sequential circuits:** Shift registers, Ripple counter, Design of Synchronous counters and sequence detectors, sequence generators.

**[10 H]**

**UNIT - III**

**A/D and D/A converters:** ADC Performance Characteristics - Resolution, Sampling Rate, Dynamic Range; Binary-weighted DAC, R-2R Ladder type networks, Successive-approximation ADC, Linear-ramp ADC, Dual-slope ADC

**Logic Families:** Characteristics, RTL and DTL circuits, TTL, ECL and CMOS Logic families. Comparison of all Logic Families.

**[10 H]**

**UNIT - IV**

**Logic Implementations** using ROM, PAL & PLA.,

**Semiconductor Memories:** Memory organization & operation, classification and characteristics of memories, RAM, ROM and content addressable memory.

**[10 H]**

**Text Books:**

1. R.P. Jain, “*Modern Digital Electronics*”, TMH, 3rd edition, 2013.
2. Morris Mano, “*Digital Design*”, PHI, 2<sup>nd</sup> edition. 2012.
3. Malvino and Leach, “*Digital principles and applications*”, TMH, 2000.

**Reference Books:**

1. R. J. Tocci, “*Digital Systems*”, PHI, 2000.
2. I. J. Nagrath, “*Electronics, Analog & Digital*”, PHI, 1999.
3. J. M. Yarbrough, “*Digital Logic-Application and Design*”, PWS Publishing, 1999.

INSTRUCTIONS TO PAPER SETTERS:	Maximum Marks: 60
<ol style="list-style-type: none"><li>1. 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 20 marks.</li><li>2. 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 of 10 marks.</li></ol>	

### UNIT I

Review of Signals: Random variable, Review of Probability distributions - Random variables - Moment generating functions and their properties - Functions of Random variables, Joint Distribution Function, Properties of Joint Distribution Function, Marginal Distribution Function, Conditional Distribution and Density-Point Conditioning and Interval Conditioning. Sum of two Random Variables, Sum of several Random Variables, Central limit theorem. Random Processes: Auto correlation, Cross correlation - Properties - Power spectral density, Cross spectral density Properties, Wiener Khintchine relation-relationship between cross power spectrum and cross correlation function. [10H]

### UNIT II

Linear Time Invariant System: System transfer function, Linear systems with random inputs, Auto correlation and cross correlation functions of input and output, white noise. Introduction to Communication Engineering: Electronic communication system, Communication channel, Brief review of signals and systems, Frequency spectrum of EM waves, Modulation, Bandwidth, Fundamentals of analog signal Transmission. Amplitude Modulation Systems: Transmission (Principle, spectrum, efficiency, power and current calculation), AM envelop, AM Modulator circuits, AM transmitters, QAM. [10H]

### UNIT III

Single Sideband Communication Systems: Single Sideband system, AM SSB full carrier, AM SSB reduced carrier, AM SSB suppressed carrier, AM independent sideband, AM vestigial sideband, Comparison of single sideband transmission to conventional AM, Single sideband generation methods, Single sideband detection. AM Receivers: Receiver Parameters (Selectivity, sensitivity, dynamic range, fidelity), TRF

Receiver; Superhetrodyne receiver, Low noise Amplifier, Mixer / converter, Noise limiter, Automatic Gain Control circuit.

Angle Modulation system: Waveforms, Mathematical Analysis, Deviation sensitivity, Phase deviation and modulation index, Frequency analysis of angle modulated system, Bandwidth requirement of angle modulated system; Noise and angle modulation, Pre-emphasis and de-emphasis. Generation of FM waves: Demodulation of FM waves, Angle Modulation vs. amplitude modulation. [10H]

#### UNIT IV

Pulse Analog Modulation: Sampling theorem, PAM, PWM and PPM generation and detection, Introduction to Pulse Code Modulation and Digital Communication.

Noise: Internal noise, External noise, Noise calculations, Noise figure, Noise temperature.

Noise in CW modulation: Noise calculation in communication system, Noise in Amplitude modulation system, Noise in Angle modulated system, Narrow band noise. [10H]

#### Text Books:

1. Simon Haykin , "Communication Systems," John Wiley & Sons, Inc, 4<sup>th</sup> Edition, 2001.
2. B. P. Lathi, "Modern Digital and Analog Communication System," Oxford University Press, 4<sup>th</sup> Edition, 1998.
3. Bernard Sklar, "Digital Communications: Fundamentals and Applications," PHI, 2001.

#### References Books:

1. George Kennedy, "Communication System," TMH, 4<sup>th</sup> Edition, 1999.
2. Taub Schilling, "Principles of Communication Systems," TMH, 2<sup>nd</sup> Edition, 1991.
3. Proakis and Salehi, "Digital Communications," McGraw-Hill, 5<sup>th</sup> Edition.



Paper Code: BCS 208  
Paper Title: Data Structure using C++

L	P	C
4	0	4

**INSTRUCTIONS TO PAPER SETTERS:**

Maximum Marks: 60

1. 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 20 marks.
2. 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 of 10 marks.

**UNIT I**

Fundamentals of Algorithm Analysis: Time and space complexity, Elementary data structures and their applications. Arrays: ordered lists, representation of arrays, sparse matrices. Linked List: singly and doubly linked lists, Circular Linked list Stacks: Primitive operations, Application of stacks, multiple stacks. Queue: Primitive operations, Application of queues, multiple queues. [10H]

**UNIT II**

Recursion: Recursive definition and processes, Factorial function, Fibonacci series, Recursive binary search. Trees: Binary Trees; Definition, traversal, threaded binary Tree. Graphs: Representation, traversal, connected components, shortest path algorithms, topological sort, Minimum Spanning Tree; Definitions and algorithms. [10H]

**UNIT III**

Searching: Sequential Search, Binary Search, Tree Searching, Binary Search Tree, Insertion & Deletion, AVL trees, Multi way search tree, B tree, B+ Tree. Hashing: Hash Function, Hash Table, Hashing Techniques. [10H]

**UNIT IV**

Sorting: Quick Sort, Merge Sort, Heap Sort and other sorting techniques, K-way Merge Sort. Files: Creation and Processing of files, File handling, Reading/ Writing of files, Operations of files, File Organization, Indexing, Error handling. Storage Management: Automatic List Management, Reference Count Method, Garbage Collection, Collection and Compaction. [10H]

**Text Books:**

1. Y. Langsam et. al., "Data Structures using C and C++," PHI, 1999.
2. R. L. Kruse, B. P. Leung, C. L. Tondo, "Data Structures and program design in C," PHI, 2000.
3. Schaum's outline series, "Data Structure," TMH, 2002.

References Books:

1. E. Horowitz and S. Sahani, "Fundamentals of Data Structures," Galgotia Booksource Pvt. Ltd, 1999.
2. Nell Dale, "C++ Plus Data Structure," Jones and Bartlett Publishers, 5<sup>th</sup> Edition, 2011.
3. Yashwant Kanetkar, "Data Structure through C," BPB, 2005.

**Paper Code: BEC 210**

**Paper Title: Transmission Lines & Antenna**

<b>L</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>4</b>

**INSTRUCTIONS TO PAPER SETTERS**

**MAXIMUM MARKS: 60**

- 1. 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 20 marks.**
- 2. 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 of 10 marks.**

**UNIT I**

Topics to be Reviewed: Mathematical Orientation Circuits and Fields, Vector Analysis, Physical Interpretation of Gradient, Divergence and Curl, Vector Relations in other Co-ordinate Systems, Line surface & volume Integrals, theorems, The Dirac Delta function, Classification of vector fields. Elec-trostatics: Fundamental Relations of the electrostatic Field, Gauss's Law, The potential Functions, Field due to a continuous distribution of charge, Equipotential surfaces, Divergence Theorem, Poisson's Equation and Laplace's Equation, Capacitance, Electrostatic Energy, Conditions at a Boundary between Dielectrics, Dirac Delta Representation for a Point Charge and an infinitesimal Dipole. **[10H]**

**UNIT II**

Magnetostatics: Magnetic Induction and Faraday's Law, Magnetic Flux Density, Magnetic Field Strength H, Ampere, Gauss Law in the Differential Vector Form, Permeability, Energy Stored in a Magnetic Field, Ampere's Law for a Current Element, Volume Distribution of Current and the Dirac Delta, Ampere's Law, Force Law, Magnetic Vector Potential, Far Field of a Current Distribution.

Maxwell's Equations: Equation of Continuity for Time Varying Fields, Maxwell's Equations, Conditions at a Boundary Surface.

Electromagnetic Waves: Solutions for Free-space conditions, Uniform Plane-wave Propagation, Uniform Plane Waves, Wave Equations for a Conduction Medium, Sinusoidal Time Variations, Conductors and Dielectrics, Polarization, Direction Cosines, Reflection from different media,

Surface Impedance, Transmission-line Analogy, Poynting's Theorem. **[10H]**

**UNIT III**

Transmission Lines: Transmission Line equation, characteristic impedance, propagation constant, attenuation and phase constant, computation of primary and secondary constants, line distortion, Loading of line, artificial lines, reflection coefficient, VSWR, reflection loss, efficiency of transmission, UHF Lines-Smith chart, Quarter wave transformer, single and double stub matching U.H.F. lines as circuit elements, Equalizers-classification, inverse networks, Lattice and Bridge T attenuator equalizers phase equalizer, attenuator. **[10H]**

**UNIT IV**

Antennas: Potential functions & Electromagnetic field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, radiation resistance. Antenna Gain, Effective Area, Antenna terminal impedance, Practical antennas and methods of

excitation, antenna temperature and signal to noise Ratio. VLF and LF transmitting antennas, Yagi-Uda array, Rhombic Antenna, Parabolic Reflectors, Horn Antenna, Introduction to Turstile antenna. **[10H]**

**Text Books:**

1. E. C. Jordon, K. G. Balmain, "Electromagnetic waves & Radiation System," PHI, 2<sup>nd</sup> Edition, 2005.
2. Fusco, "Foundations of Antenna Theory and Techniques," Pearson India, 1<sup>st</sup> Edition, 2007.

**Reference Books:**

1. William H. Hayt, "Engineering Electromagnetics," TMH, 5<sup>th</sup> Edition, 2007.
2. Balanis, "Antenna Theory: Analysis and Design," Wiley, 2<sup>nd</sup> Edition, 2007.
3. Stutzman and Thiele, "Antenna Theory and Design," Wiley, 3<sup>rd</sup> Edition, 2012.