JSS COLLEGE OF ARTS, COMMERCE AND SCIENCE

(Autonomous)

B N ROAD, MYSURU- 570 025

DEPARTMENT OF ELECTRONICS

Syllabus

CHOICE BASED CREDIT SYSTEM

For B.Sc programme

Physics, Mathematics, Electronics

2019-20

PROGRAMME CODE: BSc-04

Credit Pattern for Courses

Sem	Course Type	Course code	Course Title	L:T:P	Total Credit
I	DSC1: Theory	DMA26004	Network Analysis and Analog Electronics	4:0:0	6
	DSC1: Practical-1	DMA26104	Network Analysis and Analog Electronics	0:0:2	
II	DSC2: Theory	DMB26004	Linear and Digital Integrated Circuits	4:0:0	6
	DSC2: Practical- II	DMB26104	Linear and Digital Integrated Circuits	0:0:2	
III	DSC3: Theory	DMC26004	Communication Electronics	4:0:0	6
	DSC3: Practical- III	DMC26104	Communication Electronics	0:0:2	
IV	DSC4: Theory	DMD26004	Microprocessor and microcontrollers	4:0:0	6
	DSC4: Practical-IV	DMD26104	Microprocessor and microcontrollers	0:0:2	
V	DSE 1A : Theory	DME26004	**Digital Signal Processing**	4:0:0	5
	DSE1A: Practical-V	DME26104	Practical 5: Digital Signal Processing	0:0:1	
	DSE1B: Theory	DME26204	Electronic Instrumentation	4:0:0	5
	DSE1B: Practical-VI	DME26304	Practical 6: Electronic Instrumentation	0:0:1	
	SEC1A: Theory	DME26404	**Electrical circuits and network skills**	2:0:0	2
	SEC1B: Theory	DME26604	Computer networks	2:0:0	2
VI	DSE2A: Theory	DMF26004	**VERILOG & VHDL**	4:0:0	5
	DSE2A: Practical-VII	DMF26104	VERILOG & VHDL	0:0:1	
	DSE2B: Theory	DMF26204	Photonic Devices and Power Electronics	4:0:0	5
	DSE2B: Practical-VIII	DMF26304	Photonic Devices and Power Electronics	0:0:1	

L: Lecture, T: Tutorial, P: Practicals

Scheme for Examination and Assessment

Course type	IA C1		IA C2		SEE C3		Exam duration	
	Th	Pr	Th	Pr	Th	Pr	Th	Pr
DSC	15	7.5	15	7.5	70	35	3h	3h
DSE	15	7.5	15	7.5	70	35	3h	3h
SEC	7.5	-	7.5	-	50	-	2h	

SCHEME OF VALUATION FOR PRACTICAL EXAMINATION

- A candidate appearing for the first time should submit a duly signed and certified practical record

- Each candidate has to perform one experiment in the specified duration of two hours for *THIRY FIVE marks*

- Practical record has to be valued for *FIVE m*arks by examiners at the time of examination

- IA for *FIFTEEN marks* in practical is awarded by two tests in the lab

I.   ANALOG & DIGITAL EXPERIMENTS:

Sl no	Component	Marks
1	Write up of the experiment	10
2	Conducting experiment	10
3	Result	05
4	Viva-voce	05
5	Practical record	05
TOTAL		**35**

II. FOR PROGRAMMING EXPERIMENTS:

Sl no	Component	Marks
1	Program Writing	10
2	Entering /Coding	10
3	Execution	05
4	Practical record	05
5	Viva	05
TOTAL		**35**

Programme Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PO1: Demonstrate proficiency in Mathematics and the Mathematical concepts needed for a proper understanding of Physics.

PO2: Demonstrate the ability to justify and explain their thinking and/or approach.

PO3: Develop state-of-the-art laboratory and professional communication skills.

PO4: Apply the scientific method to design, execute, and analyze an experiment.

PO5: Explain scientific procedures and their experimental observations.

PO6. Understand the value of Mathematical proof.

PO7: Demonstrate proficiency in writing and understanding proofs.

PO8: Apply mathematical problems and solutions in aspects of science and technology.

PO9: Gain experience to investigate the real world problems.

PO10: Apply mathematical ideas and models to problems.

PO11: Apply appropriate troubleshooting techniques to electronic circuits / systems and perform test procedures.

PO12: Assist, Assemble, modify and test electronic circuits in accordance with job requirements.

PO13: Communicate effectively in technical and non-technical environments.

Programme Specific Outcome

Bachelor of Science in Physics, Mathematics, Electronics

After completing the graduation in the Bachelor of Science the students are able to:

PSO1: Find career opportunities.

PSO2: Develop competence to write competitive examinations.

PSO3: Develop proficiency in the analysis of complex physical problems.

PSO4: Use mathematical or other appropriate techniques to solve complex physical problems.

PSO5: Create a hypothesis and appreciate how it relates to broader theories.

PSO6: Demonstrate skills in the use of Computers for control, data acquisition, and data analysis in experimental investigations.

PSO7: Apply knowledge of Physics, Mathematics and Electronics fundamentals to the solve problems in Electronic circuits & communication systems.

PSO8: Apply appropriate troubleshooting techniques to Electronic circuits / systems and perform test procedures.

DSC1: DMA26004

SEMESTER I

NETWORK ANALYSIS AND ANALOG ELECTRONICS

Credits: Theory – 04

Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate Network theorems with examples
CO2: Specify the classification and characteristics of semiconductor diodes and transistors

CO3: Deliberate in detail the application of semiconductor diodes and transistors
 CO4: Understand the characteristics of FET & UJT.

Unit-1

Circuit Analysis:
Concept of Voltage and Current Sources. Kirchhoff's Current Law,   Kirchhoff's Voltage Law. Mesh Analysis. Node Analysis. Star - Delta networks – Star to Delta and Delta to Star Conversions.

Network Theorems - Superposition Theorem. Thevenin's Theorem. Norton's Theorem. Reciprocity Theorem. Maximum Power Transfer Theorem (Statement and explanation only).
 Two Port Networks: h, y and z parameters and their conversion.   (15 Lectures)

Unit-2

Junction Diode and its applications:
 PN junction diode (Ideal and practical) construction of diode, formation of depletion layer in diode, V-I characteristics. Static and dynamic resistance,

Zener diode, Reverse saturation current, Zener and avalanche breakdown. Qualitative idea of Schottky diode and Varactor diode

Rectifiers- Half wave rectifier, Full wave rectifiers (Centre tapped and Bridge) - Circuit diagrams, working and waveforms, Expressions for ripple factor and efficiency.

Filter- Shunt capacitor filter, working with FWR.

Regulation- Line and load regulation, Zener diode as voltage regulator and explanation for load and line regulation.   (15 Lectures)

Unit-3

Bipolar Junction Transistor:

Introduction to transistors- construction, types and operation of transistors, Characteristics of transistor in CE and CB configurations, Regions of operation (active, cut off and saturation), Current gains α and β. Relations between α and β. DC load line and Q point.

Transistor biasing:

Need for biasing, DC load line and Q point, Thermal runaway,

Stabilization - stability and stability factor, Expression for stability factor S. (only S_{Ico} derivation), Fixed Bias and Voltage Divider Bias. (Relevant Numericals)

Amplifiers:

Definition and classification of amplifiers, single stage CE amplifier- construction, working and frequency response

Transistor as a two port network, h-parameter equivalent circuit. Small signal analysis of single stage CE amplifier. Input and Output impedance, Current and Voltage gains.

Power amplifiers -Class A (Qualitative analysis), Class B (derivation for expression for efficiency) and class C Amplifiers (Qualitative analysis)   (15 Lectures)

Unit-4

Application of transistors:
Cascaded Amplifiers:

Multistage amplifiers, Two stage RC Coupled Amplifier and its Frequency Response.

Feedback in Amplifiers:

Concept of feedback, negative and positive feedback (expression for gain), advantages of negative feedback (Relevant Numericals).

Sinusoidal Oscillators:

Barkhausen criterion for sustained oscillations. Phase shift and Colpitt's oscillator - derivation of expression for Frequency and Condition of oscillation.

Unipolar Devices:

JFET - Construction, working and I-V characteristics (output and transfer), expression for Pinch off voltage (no derivation).-Relevant Numericals

UJT - Construction, working, equivalent circuit and I-V characteristics (Relevant Numericals)

(15 Lectures)

Reference Books:

• Electric Circuits, S. A. Nasar, Schaum's outline series, Tata McGraw Hill (2004).

• Electrical Circuits, M. Nahvi& J. Edminister, Schaum's Outline Series, Tata McGraw-Hill (2005).

• Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.

• Network, Lines and Fields, J.D.Ryder, Prentice Hall of India.

• Electronic Devices and Circuits, David A. Bell, 5th Edition 2015, Oxford University Press.

• Electronic Circuits: Discrete and Integrated, D.L. Schilling and C. Belove, Tata McGraw Hill.

• Electrical Circuit Analysis, Mahadevan and Chitra, PHI Learning.

• Microelectronic circuits, A.S. Sedra, K.C. Smith, A.N. Chandorkar, 2014, 6th Edn., Oxford University Press.

• J. Millman and C. C. Halkias, Integrated Electronics, Tata McGraw Hill (2001).

• J. J. Cathey, 2000 Solved Problems in Electronics, Schaum's outline Series, Tata McGraw Hill (1991).

DSC1: DMA26104

PRACTICAL 1
NETWORK ANALYSIS AND   ANALOG ELECTRONICS

1. To familiarize with basic electronic components (R, C, L, diodes, transistors), Digital Multimeter, Function Generator and Oscilloscope.

2. Measurement of Amplitude, Frequency & Phase difference using Oscilloscope.

3. Verification of Thevenin's theorem and (b) Norton's theorem.

4. Verification of (a) Superposition Theorem and (b) Reciprocity Theorem

5. Verification of the Maximum Power Transfer Theorem.

6. Study of the I-V Characteristics of (a) p-n junction Diode and (b) Zener diode.

7. Study of (a) Half wave rectifier and (b) Full wave rectifier (FWR) with C filter and without filter

8. Zener diode as voltage regulator (at the output of Full Wave Rectifier)

9. Study of the I-V Characteristics of UJT

10. Study of the output and transfer I-V characteristics of common source JFET.

11. Study of Fixed Bias and Voltage divider bias configuration for CE transistor.

12. Study of Single Stage CE amplifier.

13. Study of the RC Phase Shift Oscillator.

14. Study the Colpitt`s oscillator.

(Note: Minimum of Eight experiments to be conducted)

DSC 2: DMB26004

LINEAR AND DIGITAL INTEGRATED CIRCUITS

Credits: Theory – 04

Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the characteristics and applications of operational amplifiers

CO2: Design different   signal conditioning circuits like filters, A/D and D/A converters

CO3: Understand the fundamentals of converting from one number system to another

CO4: Interpret logic functions, combinational and sequential digital circuits

Unit-1

Operational Amplifiers (Black box approach):

Differential amplifier, Block diagram of Op-amp, Characteristics of an Ideal and Practical Operational Amplifier (IC 741), Open and closed loop configurations, Frequency Response. CMRR & Slew Rate.

Applications of Op-Amps:

Inverting and non-inverting amplifiers and concept of Virtual Ground, (1) Summing, Averaging and Scaling amplifiers (2) Difference Amplifier (3) Differentiator (4) Integrator (5) Active low pass and high pass Butterworth filter (1st order only).   (15 Lectures)

Unit-2

Applications of Op-amp contd. &Timer (IC 555):

Wein bridge oscillator, Comparator and Zero-crossing detector

Introduction to 555 Timer - block diagram, 555 as a monostable multivibrator and applications (Frequency divider and Pulse stretcher) 555 as an astable multivibrator and applications - square wave generator (Relevant Numerical)

D-A and A-D Conversion:

D – A conversion- 4 bit binary weighted and R-2R D-A converters,. Accuracy and Resolution.

A-D conversion - characteristics, successive approximation ADC. (Mention of relevant ICs for all).   (15 Lectures)

Unit-3

Number System and Codes:

Decimal, Binary, Octal and Hexadecimal number systems –conversion from one system to another. Representation of signed and unsigned binary numbers, Binary arithmetic- addition, Subtraction by 1's and 2's complement method, multiplication& division. BCD code (BCD Addition).

Logic Gates and Boolean algebra:

Discussion and Truth Tables of OR, AND, NOT, NOR, NAND, XOR, XNOR Gates. NAND & NOR as Universal gates. Basic postulates of Boolean algebra. Principle of duality. De Morgan's theorems. Simplification of Boolean expressions, Boolean expression for logic circuits and vice versa.

Combinational Logic Analysis and Design:

Standard representation of logic functions (SOP and POS), Minimization Techniques - Karnaugh map (minimization up to 4 variables for SOP only).   (15 Lectures)

Unit-4

Combinational and sequential circuits:
Arithmetic Circuits:

Binary Addition and subtraction - Half and Full Adder. Half and Full Subtractor, 4-bit binary Adder/Subtractor.

Data processing circuits:

Multiplexers(4 X 1) , De-multiplexers (1 X 4) ,

Decoders- 3 to 8 lines, BCD to decimal

Encoders - 8 to 3 line, Decimal to BCD encoders

Sequential Circuits:

RS flip flop, clocked RS and D flip flops. JK flip flop. Preset and Clear, Race around condition. Master-slave JK Flip-Flop.

Shift registers:

Block diagram of Serial-in-Serial-out, Serial-in-Parallel-out, Parallel-in-Serial-out and Parallel-in-Parallel-out Shift Registers (only up to 4 bits) Qualitative Analysis of Serial-in-Serial-out, Serial-in-Parallel-out.

Counters:

Asynchronous counters- Ripple counter, Decade counter. Up/Down Counter, Mod-3
                                                                    (15Lectures)

Reference Books:

- OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
- Operational Amplifiers and Linear ICs, David A. Bell, 3rd Edition, 2011, Oxford.
- University Press.
- Digital Principles and Applications, A.P. Malvino, D.P.Leach and Saha, 7th Ed., 2011, Tata McGraw.
- Fundamentals of Digital Circuits, Anand Kumar, 2nd Edn, 2009, PHI Learning Pvt. Ltd.
- Digital Circuits and systems, Venugopal, 2011, Tata McGraw Hill.
- Digital Systems: Principles & Applications, R.J.Tocci, N.S.Widmer, 2001, PHI Learning.
- Thomas L. Flyod, Digital Fundamentals, Pearson Education Asia (1994).
- R. L. Tokheim, Digital Principles, Schaum's Outline Series, Tata McGraw- Hill (1994).

DSC2: DMB26104

PRACTICAL 2
LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB

Section – A: Op-Amp. Circuits (Hardware)

1. To design an Inverting & Non-inverting amplifier using Op-amp (741,351) for DC voltage of given gain

2. To design an Inverting amplifier using Op-amp (741) & to study its frequency response(for AC voltage)

3. To design non-inverting amplifier using Op-amp (741) & to study frequency response(for AC voltage)

4. To Add / Subtract two dc voltages using Op-amp in inverting mode.

5. To study the zero-crossing detector and comparator.

6. To investigate the use of an op-amp as an Integrator.

7. To investigate the use of an op-amp as a Differentiator.

8. To study a Wien bridge oscillator using an op-amp.

9. To design an Astable Multivibrator of given specification using IC 555 Timer.

10. To design a Butterworth Low Pass active Filter (1st order) & to study Frequency Response.

11. To design a Butterworth High Pass active Filter (1st order) & to study Frequency Response.

12. R – 2R digital to analog converter (DAC).

Section-B: Digital circuits (Hardware)

1. To simplify the given Boolean expression and to construct logic circuit using basic gates

2. To study NAND & NOR gates as Universal gates

3. Half Adder and Full Adder.

4. Half Subtractor and Full Subtractor.

5. 4 bit binary Adder-Subtractor using Full adder IC.

6. Seven segment decoder.

7. Study of Encoder

8. To build Flip-Flop (RS, Clocked RS, D-type and JK) circuits using NAND gates.

9. To build JK Master-slave flip-flop using Flip-Flop ICs.

10. To build a Counter using D-type/JK Flip-Flop ICs and study timing diagram.

11. To make a Shift Register (serial-in and serial-out) using D-type/JK Flip-Flop ICs.

Section-C: SPICE/MULTISIM simulations for electronic circuits and devices

1. To verify the Thevenin's and Norton Theorems.

2. Design and analyze the series and parallel LCR circuits

3. Design the inverting and non-inverting amplifier using an Op-Amp of given gain

4. Design and Verification of op-amp as integrator and differentiator

5. Design the 1st order active low pass and high pass filters of given cut-off frequency

6. Design a Wein Bridge oscillator of given frequency.

7. Design clocked SR and JK Flip-Flop`s using NAND Gates

8. Design 4-bit asynchronous counter using Flip-Flop ICs

9. Design the CE amplifier of a given gain and its frequency response.

(Minimum of 05 experiments from section A, B and C to be done)

DSC3: DMC26004

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SEMESTER III
COMMUNICATION ELECTRONICS

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Credits: Theory – 04,

Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the classification and characteristics of analog communication systems

CO2: Identify the classification and characteristics of pulse modulation systems

CO3: Specify the classification and characteristics of digital communication systems

CO4: Specify the classification and characteristics of satellite communication systems

CO5: Identify the classification and characteristics of mobile communication systems

Unit-1

Electronic communication:

Introduction to communication – means and modes. Block diagram of an electronic communication system. Brief idea of frequency allocation for radio communication system in India (TRAI). Electromagnetic communication spectrum, band designations and usage. Channels and base-band signals. Concept of Noise – External Noise – Atmospheric noise, Extraterrestrial noise, Industrial noise.   Internal noise –Thermal agitation Noise, Shot Noise, Transit- time Noise, Miscellaneous Noise. Signal-to-Noise (S/N) ratio.

Analog Modulation – Amplitude modulation:

Modulation-types of modulation Need for modulation, Amplitude Modulation, modulation index – expression for modulation index, Analysis of AM wave, Frequency spectrum of AM wave, Power Relation, Current Calculation, Modulation by several sine waves. Generation of AM (Emitter Modulation),

Single Side Band Generation- Balanced Modulator and suppression of sidebands using filter method.

Amplitude Demodulation (diode detector),   (15 Lectures)

Unit-2

Analog Modulation contd:

Frequency Modulation (FM) modulation index, Analysis of FM Wave and frequency spectrum Phase Modulation (PM), equivalence between FM and AM, Generation of FM using VCO, FM detector (slope detector),

Receivers:

Characteristics of a Radio Receiver, Block diagram of AM & FM super heterodyne receiver

Analog Pulse Modulation:

Channel capacity, Sampling theorem, Basic Principles-PAM, PWM, PPM, modulation and detection technique for PAM only, Multiplexing.   (15 Lectures)

Unit-3

Digital Pulse Modulation:

Need for digital transmission, Pulse Code Modulation, Digital Carrier Modulation Techniques, Sampling, Quantization and Encoding. Concept of Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), and Binary Phase Shift Keying (BPSK).

Satellite Communication

Introduction, need for satellite communication, orbital Parameters, Kepler's Laws, Types of Orbits, Geosynchronous satellite orbits, geostationary satellite, advantages of geostationary satellites. Antenna Look Angles, Satellite visibility, transponders (C - Band), ground station, simplified block diagram of earth station   (15 Lectures)

Unit-4

Mobile Telephony system

Basic concept of mobile communication, frequency bands used in mobile communication, Frequency reuse, Interference- Co-channel interference, Adjacent channel Interference, Cell splitting, Sectoring, Segmentation and Dualization, Roaming and Handoffs, SIM number, IMEI number, need for data encryption, Architecture (block diagram) of mobile communication network. Idea of GSM, CDMA, TDMA and FDMA technologies, GPS navigation system (qualitative idea only)   (15 Lectures)

Reference Books:

• Electronic Communications, D. Roddy and J. Coolen, Pearson Education India.

• Advanced Electronics Communication Systems- Tomasi, 6th edition, Prentice Hall.

• Modern Digital and Analog Communication Systems, B.P. Lathi, 4th Edition, 2011, Oxford University Press.

• Electronic Communication systems, G. Kennedy, 3rd Edn., 1999, Tata McGraw Hill.

• Principles of Electronic communication systems – Frenzel, 3rd edition, McGraw Hill.

• Communication Systems, S. Haykin, 2006, Wiley India.

• Electronic Communication system, Blake, Cengage, 5th edition.

• Wireless communications, Andrea Goldsmith, 2015, Cambridge University Press.

DSC3: DMC26104

PRACTICAL 3
COMMUNICATION ELECTRONICS

1. To study an Amplitude Modulator using Transistor.
2. To study envelope detector for demodulation of AM signal.
3. To study FM – Generator.
4. To study AM Transmitter and Receiver
5. To study FM Transmitter and Receiver
6. To study Time Division Multiplexing (TDM)
7. To study Pulse Amplitude Modulation (PAM).
8. To study Pulse Width Modulation (PWM).
9. To study Pulse Position Modulation (PPM).
10. To study ASK modulators.
11. To study PSK modulators.
12. To study FSK modulators.
13. IF amplifier.
14. RF amplifier.

(Minimum of Eight experiments to be conducted)

DSC 4: DMD26004

SEMESTER IV

MICROPROCESSOR AND MICROCONTROLLER LAB

Credits: Theory – 04
Practical – 02 Theories: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Understand the architecture of 8085 microprocessors

CO2: Write down the instruction set and simple programs of 8085 microprocessors.

CO3: Understand the architecture and instruction set of 8051microcontrollers

CO4: Specify the characteristics of embedded system

.Unit-1

8085 Microprocessor:

 Block diagram of Digital Computer, Microcomputer Organization, Bus organization of 8085, Memory – types of memory , Input /Output

Architecture:

Main features of 8085. Block diagram. Pin-out diagram of 8085. Control and Status Signals, Power supply and Clock Frequency. Architecture –ALU, Flags & Registers and Timing and Control unit.

8085 Programming:

 Instruction format-Word sizes, Opcode format Instruction classification, Data transfer, Timing diagram of MOV and MVI, Arithmetic, logical and branch instructions, Simple Programs

(15 Lectures)

Unit-2

8051 microcontroller:

Introduction and block diagram of 8051 microcontroller, Overview of 8051 family, comparison between Microprocessor and Microcontroller. Pin diagram of 8051, I/O port pins description and their functions. Architecture of 8051 – Block diagram, Oscillator and clock, Program Counter and Data Pointer, A & B CPU registers, flags and PSW, Internal memory, Internal RAM, Internal ROM, Stack and Stack pointer, Special function registers and their addresses. Timers & Interrupts.   (15 Lectures)

Unit-3

8051 Programming:
8051 Addressing modes – Immediate, Register, Direct and Indirect addressing modes. Indexed addressing mode- MOVC & MOVX instructions.

Arithmetic instructions – Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic.

Logic Instructions – Byte level and Bit level logical instructions, Rotate and Swap instructions   (15 Lectures)

Unit-4

JUMP, LOOP & CALL instructions - Loop and Jump instructions, Call instructions.

8051 interfacing with 8255 – Programming 8255, mode selection of 8255, DAC interfacing

Introduction to embedded system:
Embedded systems and general purpose computer systems. Architecture of embedded system. Classifications, applications of embedded systems.   (15 Lectures)

Reference Books:
- Microprocessor Architecture Programming & applications with 8085, 2002, R.S.Goankar, Prentice Hall.
- Embedded Systems: Architecture, Programming & Design, Raj Kamal, 2008, Tata McGraw Hill.
- The 8051 Microcontroller and Embedded Systems Using Assembly and C, M.A.Mazidi, J.G. Mazidi, and R.D. McKinlay, 2nd Ed., 2007, Pearson Education India.
- Microprocessor and Microcontrollers, N. Senthil Kumar, 2010, Oxford University Press.
- 8051 microcontrollers, Satish Shah, 2010, Oxford University Press.
- Embedded Systems: Design & applications, S.F. Barrett, 2008, Pearson Education India.
- Introduction to embedded system, K.V. Shibu, 1st edition, 2009, McGraw Hill.
- Embedded Microcomputer systems: Real time interfacing, J.W. Valvano 2011,Cengage Learning

DSC 4: DMD26104

PRACTICAL IV
MICROPROCESSOR AND MICROCONTROLLER LAB

Section-A: Programs using 8085 Microprocessor
1. Addition and subtraction of numbers using direct addressing mode.
2. Addition and subtraction of numbers using indirect addressing mode.
3. Multiplication by repeated addition.
4. Division by repeated subtraction.
5. Finding Largest among a group of numbers.
6. Finding Smallest among a group of numbers.
7. Arranging in an ascending order of a group of numbers.
8. Arranging in descending order of a group of numbers
9. Other programs (e.g. Parity Check, etc.).

Section-B: Experiments using 8051 microcontroller:

1. Binary addition , subtraction , multiplication and division
2. 8 bits multiplication and division.
3. Fibonacci series.
4. Average of a number.
5. Square and Square root of a number.
6. Palindrome.
7. BCD to Binary conversion.
8. Finding the smallest and largest numbers from the given N binary numbers.
9. To find that the given numbers is prime or not.
10. To find the factorial of a number.
11. Write a program to make the two numbers equal by increasing the smallest number and decreasing the largest number.
12. Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's. 5. Program to glow the first four LEDs then next four using TIMER application.
13. Program to rotate the contents of the accumulator first right and then left.
14. Program to run a countdown from 9-0 in the seven segment LED display.

15. To interface seven segment LED display with 8051 microcontroller and display 'HELP' in the seven segment LED display.

16. To toggle '1234' as '1324' in the seven segment LED display.

17. To generate different types of wave forms using DAC interface

18. Application of embedded systems: Temperature measurement & display on LCD

Note: At least 04 experiments from section A and B to be done

DSE 1A: DME26004

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SEMESTER V

DIGITAL SIGNAL PROCESSING

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Credits: Theory – 04

 Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of discrete/digital signals and systems

CO2: Understand the classification and characteristics of frequency domain analysis of discrete

        time signals.

CO3: Specify with examples DSP filters

Unit-1

Discrete-Tim e Signals and Systems:

Classification of Signals: Continuous-time and Discrete-Time signals, Analog and Digital signals, Periodic and Aperiodic Signals, Energy and Power Signals, Even and Odd Signals. Operations on Dependent and Independent Variables. Continuous- Time System and Discrete-Time Systems: Unit Step Response, Impulse Response and Ramp Response. Exponential signals, exponentially damped sinusoidal signals, pulse signals

Basic Discrete Time signals – Step function, Impulse function, Ramp function, Exponential function, Sinusoidal signals, Exponentially damped sinusoidal signals, Pulse signals

System Properties: Linearity, Causality; Time-Invariance, Memory, Stability and Invertibility. Linear Time Invariant Systems- Convolution Sum. Convolution Integral, Representation for LTI System – two systems in Parallel, Two systems in Cascade.   (15 Lectures)

UNIT 2:

The Z-Transform:

Introduction, Definition of Z – transform, Transform and ROC of Finite Duration Sequences – Right Sided Sequence, Left Sided Sequence, Double Sided Sequences.

Z – Transform and ROC of Infinite Duration Sequences- Positive Time Exponential Sequence, Negative Time Exponential Sequence, Double sided Exponential Sequence, ROC & Stability, Properties of ROC . Problems**.**

Properties of Z-Transform-Linearity, Time Shift or Translation, Multiplication by an Exponential, Multiplication by a Ramp, Convolution (Time-domain), Time-reversal, Convolution (Z-domain), Initial-value theorem, Final value theorem. Transforms of some useful Sequences.

Inverse Z- transform-Partial fraction expansion method, Inverse Z- transform by long division method.

UNIT 3:

Discrete-Time Fourier Transform:

DFT - Introduction. Definition of DFT and IDFT- Lemma, Inverse DFT, Periodicity of X(k) and x(n).
Matrix relation for computing DFT, Matrix relation for Computing IDFT, Using DFT to find IDFT, Concept circular shift and circular symmetry, Properties of DFT – Linearity, Circular time shift, Circular frequency shift.
Fast Fourier Transform (FFT) – Decimation-in-time FFT, Further reduction: Cooley-Turkey Algorithm, In-place computations, Decimation in frequency FFT.   (15 Lectures)

UNIT 4:

Filter Concepts: Linear-Phase Filter, Simple FIR Digital Filters, Simple IIR Digital Filters, All pass Filters

Design of IIR Filters:

Introduction, Analog Filter Specifications, Classification of Analog Filters, Butterworth Filters, Frequency transformations / Spectral Transformations, Design of Low pass Butterworth Filters, Digital filters, Backward difference method, Bilinear Transformations, Analog Design using Digital filters, Advantages and Disadvantages of IIR Filters.   (15 Lectures)

Reference Books:
- Digital Signal Processing, Tarun Kumar Rawat, 2015, Oxford University Press, India.
- Digital Signal Processing, S. K. Mitra, McGraw Hill, India.
- Principles of Signal Processing and Linear Systems, B.P. Lathi, 2009, 1st Edn. Oxford University Press.
- Fundamentals of Digital Signal processing using MATLAB, R.J. Schilling and S.L.Harris, 2005, Cengage Learning.
- Fundamentals of signals and systems, P.D. Cha and J.I. Molinder, 2007, Cambridge University Press.
- Digital Signal Processing Principles Algorithm & Applications, J.G. Proakis and D.G. Manolakis, 2007, 4th Edn., Prentice Hall.

DSE 1A: DME26104

PRACTICAL V
DIGITAL SIGNAL PROCESSING

1. Verification of properties of a system : linear and convolution

2. Finding DFT of a given sequence - direct method

3. Finding IDFT of a given sequence - direct method

4. Linear convolution using DFT

5. Circular convolution using DFT

6. Solution of simple difference equations

7. Verification of sampling theorem

8. Determination of impulse response of a given system

9. Determination of Frequency response of system to any arbitrary input

10. Design of simple IIR filters – Butterworth

11. DFT using FFT

12. IDFT using FFT

(Note: Minimum of Eight experiments to be done).

DSE 1B: DME26204

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SEMESTER V

ELECTRONIC INSTRUMENTATION

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Credits: Theory – 04
Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course a student is able to

CO1: Specify in detail, basic electronic measurement instruments.

CO2: Write down the classification and working of impedance measuring instruments.

CO3: Specify the details of power supply.

CO4: Understand the working and applications of transducers

Unit 1:

Measurements

Accuracy and precision. Significant figures. Error and uncertainty analysis. Shielding and grounding. Electromagnetic Interference.

Basic Measurement Instruments:

DC measurement-ammeter, voltmeter, ohm meter, AC measurement, Digital voltmeter systems (integrating and non-integrating). Digital Multimeter; Block diagram principle of measurement of I, V, C. Accuracy and resolution of measurement.

Measurement of Impedance-

A.C. bridges, Measurement of Self Inductance (Anderson's bridge), Measurement of Capacitance (De Sauty's bridge), Measurement of frequency (Wien's bridge).

(15 Lectures)

Unit 2:

Power supply

Block Diagram of a Power Supply, Qualitative idea of C and L Filters. IC Regulators (78XX and 79XX), Line and load regulation, Short circuit protection. Idea of switched mode power supply (SMPS) and uninterrupted power supply (UPS).

Oscilloscope:

Block Diagram, CRT, Vertical Deflection, Horizontal Deflection. Screens for CRT, Oscilloscope probes, measurement of voltage, frequency and phase by Oscilloscope. Digital Storage Oscilloscopes. LCD display for instruments.   (15 Lectures)

Unit 3:

Lock-in-amplifier:

Basic Principles of phase locked loop (PLL), Phase detector (XOR & edge triggered), Voltage Controlled Oscillator (Basics, varactor), lock and capture. Basic idea of PLL IC (565 or 4046). Lock-in-amplifier, Idea of techniques for sum and averaging of signals.

Signal Generators:

Function generator, Pulse Generator, (Qualitative only).

Virtual Instrumentation:

Introduction, Interfacing techniques (RS 232, GPIB, USB), Idea about Audrino microcontroller and interfacing software like lab View). (15 Lectures)

Unit 4:

Transducers:

Classification of transducers, Basic requirement/characteristics of transducers, Active and Passive transducers, Resistive (Potentiometer- Theory, temperature compensation & applications), Capacitive (variable air gap type), Inductive (LVDT) & piezoelectric transducers. Measurement of temperature (RTD, semiconductor IC sensors), Light transducers (photo resistors & photovoltaic cells). (15 Lectures)

Reference Books:

• W.D. Cooper and A. D. Helfrick, Electronic Instrumentation and Measurement Techniques, Prentice Hall (2005).

• E.O. Doebelin, Measurement Systems: Application and Design, McGraw Hill Book - fifth Edition (2003).

• David A. Bell, Electronic Devices and Circuits, Oxford University Press (2015).

• Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Butterworth Heinmann-2008).

• S. Rangan, G. R. Sarma and V. S. Mani, Instrumentation Devices and Systems, Tata Mcgraw Hill (1998).

• Introduction to measurements and instrumentation, 4th Edn., Ghosh, PHI Learning.

DSE 1B: DME26304

PRACTICAL   VI
ELECTRONIC INSTRUMENTATION LAB

1. Measurement of resistance by Wheatstone bridge and measurement of bridge sensitivity.

2. Measurement of Capacitance by De Sauty's bridge.

3. To determine the Characteristics of resistance transducer - Strain Gauge (Measurement of Strain using half and full bridge).

4. To determine the Characteristics of LVDT.

5. To determine the Characteristics of Thermistors and RTD.

6. Measurement of temperature by Thermocouples.

7. Design a regulated power supply of given rating (5 V or 9V).

8. To design and study the Sample and Hold Circuit.

9. To plot the frequency response of a microphone.

(Note: Minimum   of Eight experiments to be done).

DSE 2A: DMF26004

VERILOG & VHDL

Credits: Theory – 04,
 Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Identify the details of Digital logic design flow.

CO2: Learn the characteristics and model the digital circuits using VHDL behavioural modelling

CO3: Deliberate in detail the dataflow and structural modelling in VHDL

CO4: Describe digital circuits utilizing various constructs of Verilog

Unit-1

Digital logic design flow

 Review of combinational circuits. Combinational building blocks: multiplexers, demultiplexer, decoders, encoders and adder circuits. Review of sequential circuit elements: flip-flop, latch and register. Finite state machines: Mealy and Moore. Other sequential circuits: shift registers and counter   (15 lectures)

Unit-2
Verilog HDL:

Introduction to HDL. Verilog primitive operators and structural Verilog. Behavioural Verilog. Design verification. Modelling of combinational and sequential circuits (including FSM and FSMD) with Verilog Design examples in Verilog.   (15 lectures)

Unit-3
VHDL: Basic Language elements

 Identifiers, Data Objects, Data types, Operators

Behavioral Modelling

Entity Declaration, Architecture Body, Process statement, Variable assignment statement, Signal Assignment, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit

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statement, Next statement, Assertion statement, Report statement, More on Signal Assignment statement, other sequential statements. (15 Lectures)

Unit-4

Dataflow Modelling

Concurrent Signal Assignment, Concurrent versus Sequential Signal Assignment, Delta Delay Revisited, Multiple Drivers, Conditional Signal Assignment Statement, Selected   Signal Assignment Statement, The UNAFFECTED value, Block Statement, Concurrent Assertion Statement, Value of signal.

Structural Modeling

An example, Component Declaration, Component Instantiation, Other examples. Resolving Signal Values (15 lectures)

Reference Books:
1. LizyKurien and Charles Roth. *Principles of Digital Systems Design and VHDL.*Cengage Publishing. ISBN-13: 978-8131505748.
2. Palnitkar, Samir, *Verilog HDL.* Pearson Education; Second edition (2003).
3. Ming-Bo Lin. *Digital System Designs and Practices: Using Verilog HDL andFPGAs.* Wiley India Pvt Ltd. ISBN-13: 978-8126536948.
4. ZainalabedinNavabi. *Verilog Digital System Design.* TMH; 2ndedition. ISBN-13:978-0070252219.
5. Wayne Wolf. *FPGA Based System Design.* Pearson Education.S. K. Mitra, Digital Signal processing, McGraw Hill, 1998.
6. VLSI design, Debaprasad Das, 2nd Edition, 2015, Oxford University Press.
7. D.J. Laja and S. Sapatnekar, Designing Digital Computer Systems wit.

DSE 2A: DMF26104

PRACTICAL VII
VERILOG AND VHDL LAB

Experiments using Verilog

1. Write code to realize basic and derived logic gates.

2. Half adder, Full Adder using basic and derived gates.

3. Half Subtractor and Full Subtractor using basic and derived gates.

4. Design and simulation of a 4 bit Adder.

5. Multiplexer (4x1) and Demultiplexer using logic gates.

6. Decoder and Encoder using logic gates.

7. Clocked D, JK and T Flip flops (with Reset inputs).

8. 3-bit Ripple counter

Experiments using VHDL

1. Behavioral modeling and simulation of basic gates

2. Structural modeling and simulation of simple Boolean expression

3. Modeling and simulation of adders and subtractors

4. Modeling and simulation of magnitude comparators

5. Modeling and simulation of Flip-flops

6. Modeling and simulation of Shift registers

7. Modeling and simulation of Counters

8. Modeling and simulation of encoders and decoders

9. Modeling and simulation of multiplexers

Note: At least 04 experiments - each from section A and B to be done.

DSE2B: DMF26204

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SEMESTER VI

PHOTONIC DEVICES AND POWER ELECTRONICS

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Credits: Theory – 04
 Practical – 02   Theory: 60 Lectures

COURSE OUTCOME:

After completion of the course the student is able to

CO1: Deliberate the Principles and operations of Photonic devices.

CO2: Deliberate the Principle of operation and characteristics of optical fibers

CO3: Understand the mode of signal prorogation in optical fibres

CO4: Deliberate the characteristics and application of power devices

UNIT 1:

Photonic Devices

Classification of photonic devices. Interaction of radiation and matter, Radiative transition and optical absorption. Light Emitting Diodes- Construction, materials and operation. Semiconductor Laser- Condition for amplification, laser cavity, heterostructureand quantum well devices. Charge carrier and photon confinement, line shape function. Threshold current. Laser diode. Photodetectors: Photoconductor. Photodiodes (p-i-n, avalanche) and Photo transistors,quantum efficiency and responsivity. Photomultiplier tube.   (15 Lectures)

UNIT 2:

Solar Cell

Construction, working and characteristics LCD Displays: Types of liquid crystals, Principle of Liquid Crystal Displays,applications, advantages over LED displays.

Introduction to Fiber Optics:

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics- Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.   (15 Lectures)

UNIT 3:

POWER ELECTRONICS

Power Devices:

Need for semiconductor power devices, Power MOSFET (Qualitative).Introduction to family of thyristors. Silicon Controlled Rectifier (SCR)- structure, I-Vcharacteristics, Turn-On and Turn-Off characteristics, ratings, Gate-triggering circuits.Diac and Triac- Basic structure, working and V-I characteristics. Application of Diacasa triggering device for Triac.   (15 Lectures)

UNIT 4:

Insulated Gate Bipolar Transistors (IGBT):

Basic structure, I-V Characteristics,switching characteristics, device limitations and safe operating area (SOA).

Applications of SCR:

Phase controlled rectification, AC voltage control using SCR and Triac as a switch. Power Invertors- Need for commutating circuits and their varioustypes, dc link invertors, Parallel capacitor commutated invertors, Series Invertor,limitations and its improved versions, bridge invertors.   (15 Lectures)

Reference Books:

1. J. Wilson & J.F.B. Hawkes, Optoelectronics: An Introduction, Prentice Hall India (1996).
2. S.O. Kasap, Optoelectronics & Photonics, Pearson Education (2009).
3. AK Ghatak& K Thyagarajan, Introduction to fiber optics, Cambridge Univ. Press (1998).
4. Power Electronics, P.C. Sen, Tata McGraw Hill.
5. Power Electronics, M.D. Singh & K.B. Khanchandani, Tata McGraw Hill.
6. Power Electronics Circuits, Devices & Applications, 3rd Edn., M.H. Rashid,Pearson Education.
7. Optoelectronic Devices and Systems, Gupta, 2nd edn., PHI learning.
8. Electronic Devices and Circuits, David A. Bell, 2015, Oxford University Press.

DSE 2B: DMF26304

PRACTICAL VIII
PHOTONIC DEVICES AND POWER ELECTRONICS

1. To determine wavelength of sodium light using Michelson's Interferometer.

2. Diffraction experiments using a laser.

3. Study of Electro-optic Effect.

4. To determine characteristics of (a) LEDs, (b) Photo voltaic cell and (c) Photo diode.

5. To study the Characteristics of LDR and Photodiode with (i) Variable Illumination intensity, and (ii) Linear Displacement of source.

6. To measure the numerical aperture of an optical fiber.

7. Output and transfer characteristics of a power MOSFET.

8. Study of I-V characteristics of SCR.

9. SCR as a half wave and full wave rectifiers with R and RL loads.

10. AC voltage controller using TRIAC with UJT triggering.

11. Study of I-V characteristics of DIAC

12. Study of I-V characteristics of TRIAC.

SEC1A: DME26404

ELECTRICAL CIRCUITS AND NETWORK SKILLS

Credits: 02   Theory: 30 Lectures

Course Outcome:

After completion of the course the student acquires skill to

CO1: Design and trouble shoot the electrical circuits and networks

CO2: Carry-out simple domestic wiring.

UNIT 1:

Basic Electricity Principles:

Discussion of Voltage (AC & DC), Current(AC & DC), Resistance, and Power. Ohm's law. Series, parallel, Series and Parallel combinations of R, L and C. Response of inductors and capacitors with DC or AC sources. Impedance in of Inductor and Capacitor

Electrical Circuits:

DC Circuits - Basic electric circuit elements and their combination in DC circuits. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. **AC Circuits** - . Simple numericals on network theorms. Real, imaginary and complex power components of AC source. Power factor. Saving energy and money.

Electrical Drawing and Symbols:

 Drawing symbols. Blueprints. Reading Schematics. Ladder diagrams. Electrical Schematics. Power circuits. Control circuits. Reading of circuit schematics. Tracking the connections of elements and identify current flow and voltage drop.   (15 Lectures)

UNIT 2:

Generators and Transformers:

DC Power sources. AC/DC generators. Basic principle of operation, constructional features. Transformers – Principle of working, Construction and Operation of transformers.

Electric Motors:

Single-phase, three-phase & DC motors - Construction and Working. Speed & power of ac motor. Interfacing DC or AC sources/ Motors to control heaters

Solid-State Devices: Diodes, types of diodes –symbol and applications, Rectifiers - PN junction diode as rectifier (Half wave and Full wave rectifier) construction and working

Electrical Protection:

 Relays - Relay as protection device, Fuses and disconnect switches. Circuit breakers. Overload devices. Ground-fault protection. Grounding and isolating. Phase reversal. Surge   protection.

Electrical Wiring:

Different types of conductors and cables. Basics of wiring-Star and delta connection. Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays. Splices: wirenuts, crimps, terminal blocks, and solder. Preparation of extension board.   (15 Lectures)

Reference Books:
1. Electrical Circuits, K.A. Smith and R.E. Alley, 2014, Cambridge University Press.
2. A text book in Electrical Technology - B L Theraja - S Chand & Co.
3. A text book of Electrical Technology - A K Theraja.
4. Performance and design of AC machines - M G Say ELBS Edn.

https://drive.google.com/file/d/1qzea3KMY6yomll0MIzZpsGnMQe1zCWtp/view?usp=sharing

SEC1B: DME26604

<h1 style="text-align:center">COMPUTER NETWORKS</h1>

Credits: 02   Theory: 30 Lectures

COURSE OUTCOME:

After completion of the course the student acquires skill to
CO1: Understand   the concepts of network devices
 CO2: Understand   the terminology and concepts of the OSI model

Unit 1:

Data communication, Components & Basic Concepts

Line configuration- point-to-point, multipoint, Topology – Mesh, Star, Tree, Bus, Ring, and

Hybrid Topologies Transmission modes – Simplex, Half Duplex, Full Duplex. Categories of

networks – LAN, MAN, WAN, Internet

Transmission Media

Guided media – Twisted pair cable, Co-axial cable, Optical fiber

Multiplexing:

Many to one/one to many, types of multiplexing, Frequency division multiplexing, time division

multiplexing, multiplexing applications

Error detection

Types of error, multiple bit error, Burst error,Detection – redundancy, Checksum   Error

correction – Single bit error correction, Hamming code   (15 Lectures)

Unit 2

The OSI Model

Model **–** layered Architecture, Functions of layers- physical layer, Data link layer, Network

layer, Transport layer, Session layer, Presentation Layer, Application layer

Networking and internetworking devices

   Repeaters, Bridges- types of Bridges, Routers- Routing concepts, Gate ways

World Wide Web:

 Uniform Resource Locator (URL), Browser Architect   (15 Lectures)

Text Book:
          Introduction to Data Communications & Networking by- BEHROUZ FOROUZAN
Reference Book:
          Computer Networks by – ANDREW S TANENBAUM

Pattern of theory Question Paper for DSC/DSE

From the academic year 2019-2020 onwards

Time: 3 hours   **Max. Marks: 70**

Credits: 4

Part –A

I.   **Answer all questions.**   **1 x 10 = 10**
   - Ten questions to be set from the four units of the syllabus.
   - Minimum of two questions to be set from each unit.
   - Questions can be simple problems also.

Part - B

II.   **Answer any Four questions.**   **4 x 5 = 20**

   - **Six** questions to be set from four units of the syllabus.
   - Minimum of one question to be set from each unit,
   - This section can have questions / problems.

Part - C

III.   **Answer any Four questions**   **4 x 10 = 40**
   - **Six** questions to be set from four units of the syllabus.
   - Minimum of one question to be set from each unit.
   - Questions can have subdivisions.

Model Question Paper for DSC/DSE

Time: 3 hours   **Max. Marks: 70**

Part –A

1.   **Answer all questions.**   **1 x 10 = 10m**
        (a)
        (b)
        (c)
        (d)
        (e)
        (f)
        (g)
        (h)
        (i)
        (j)

Part - B

Answer any Four questions.   **4 x 5 = 20**

2.
3.
4.
5.
6.
7.

Part - C

Answer any Four questions   **4 x 10 = 40**

8.
9.
10.
11.
12.
13.

Pattern of theory Question Paper for SEC

Time: 2 hours   **Max. Marks: 35**

Credits: 2

Part –A

I.   **Answer all questions.**   **1 x 05 =05m**

- Five questions to be set from the two units of the syllabus.

- Minimum of two questions to be set from each unit.

- Questions can be simple problems also.

Part –B

II.   **Answer any <u>Three</u> questions**   **3x 10 = 30m**

- Five questions to be set from the two units of the syllabus.

- Minimum Two questions/ Problems to be set from each unit.

From the academic year 2019-2020 onwards

Time: 2 hours   **Max. Marks: 35**

1.   Answer all questions.   **5 x 1 = 05m**
        (a)
        (b)
        (c)
        (d)
        (e)

Part - B

Answer any <u>Three</u> questions.   **3 x 10 = 30m**

2.
3.
4.
5.
6.