

**DETAILED SYLLABUS FOR THE POST OF
WORKSHOP INSTRUCTOR/DEMONSTRATOR/ INSTRUCTOR GR.II IN ELECTRONICS
AND COMMUNICATION (Technical Education)**

(Cat.No. 679/2022)

(TOTAL MARKS – 100)

MODULE 1 (10 marks)

Introduction to Electronics and Passive Components

Introduction to electronics - applications of electronics - types of electronic components - active and passive - types of passive components - resistors, capacitors and inductors - resistors - definition of resistance, symbol, specifications - classification of resistors - fixed, variable - resistor colour coding - capacitors - definition of capacitance, symbol, specifications, classification - fixed and variable - inductors - definition of inductance, symbol, specifications, classification - fixed and variable inductors - transformers - working principle and application.

MODULE 2 (10 marks)

Electronics devices and Circuits

Transistor as amplifier: Load line - operating point - need for stabilization of operating point - transistor biasing circuits. Transistor amplifier (CE) - principle of operation - expression for voltage gain, current gain, power gain, input and output impedances - frequency response and bandwidth - Series and parallel resonant circuits - expression for resonant frequency - relation between resonant frequency, "Q" and bandwidth - single tuned amplifier - operation, frequency response, applications multistage amplifier - methods of interstage coupling.

MODULE 3 (10 marks)

Oscillators and wave shaping circuits

Oscillators - principle of operation - Barkhausen criterion for oscillation - RC phase shift oscillator - Wien Bridge oscillator - applications of RC oscillators - principle of LC oscillators - Hartley and Colpitts oscillators - applications of LC oscillator - piezo-electric effect - crystal oscillator - operation - advantages - applications - multivibrators - types - operation- waveforms - applications -Astable multivibrator - RC differentiator and integrator - conditions for proper integration and differentiation - applications.

MODULE 4 (10marks)

Digital Electronics

Combinational logic circuits - introduction - design half adder, full adder, half subtractor and full subtractor - parallel adder-multiplexer / data selector - 4 to 1 MUX - applications of MUX - demultiplexer - 1 to 4 demultiplexer - 3 bit encoder - decoders - BCD to decimal, binary to gray code and gray to binary. Sequential logic circuits - introduction - synchronous and asynchronous sequential logic circuits - SR flip flop - SR latch - SR flip flop using NAND & NOR gates - JK flip flop with preset and clear inputs - D flip flop - T flip flop - master slave JK flip-flop - flip flop IC 7476. shift registers. ring counter - Johnson counter. Binary counters - implementation of asynchronous mod-10 counter - implementation of mod-8 synchronous counter.

MODULE 5 (10 marks)

Principles of communication

Need for modulation - AM, FM and PM – basic principle - definition - AM – waveform - expression for AM voltage - modulation index - significance of side bands - frequency spectrum - AM modulator circuit - balanced modulator - DSBSC, SSBSC and VSB - frequency spectrum - FM - definition - waveform - modulation index - frequency spectrum and band width - comparison of AM and FM.

MODULE 6 (10 marks)

Radio transmitters and receivers

Block diagram of AM transmitter - function of each block - block diagram of a FM transmitter - direct and indirect FM generation - pre-emphasis and de-emphasis - AFC - noise in communication systems - different types of noise - signal to noise ratio - methods to improve signal to noise ratio. Demodulation and Radio Receivers.

Need for demodulation - principles of superheterodyne receiver - block diagram of superheterodyne receiver - AM demodulator circuits - diode detector - simple and delayed AGC - choice of IF in super heterodyne receiver - characteristics of radio receiver - selectivity, sensitivity, fidelity and noise figure - block diagram of FM receiver - need for limiter in FM receiver - comparison of FM and AM receiver.

MODULE 7 (10 marks)

Measuring Instruments

Terminologies in measurements - accuracy - precision - sensitivity - resolution - galvanometer - working - conversion of galvanometer into voltmeter and ammeter - differences between moving coil and moving iron instruments - analog multimeter - block diagram - use of galvanometer as multimeter - measuring circuit for measurement of resistance, dc current, dc voltage, ac current and ac voltage - specifications - digital frequency meter - digital multimeter - block diagram - difference between 3 1/2 and 4 1/2 digit displays in terms of accuracy. CRO - applications - functional block diagram, CRT - construction - electrostatic focusing and deflection system - deflection sensitivity - types of CRO probes - measurement of voltage (DC and AC), frequency, phase angle and time period with CRO - difference between dual beam and dual trace CROs - digital storage oscilloscope - block diagram - working principle.

MODULE 8 (10marks)

Study of operational amplifiers

Block diagram of general purpose operational amplifier - differential amplifier - op-amp symbol - package types - pin configuration - manufacturer's identifying initials and designations for linear ICs - concept of virtual ground - electrical parameters of op-amp - characteristics of an ideal op-amp - inverting amplifier and non inverting amplifier - expression for voltage gain - voltage follower.

PLL AND TIMERS - General block diagram of PLL - capture range, lock range, and pull in time - block diagram of VCO NE / SE 566 - electrical characteristics of 565 PLL - functional block diagram of PLL NE / SE 565 - applications of PLL as frequency multiplier and FM demodulator - features of 555 timer - functional block diagram of 555 timer - astable and monostable circuits using 555 timer - expression for time period - LM 380 audio power amplifier.

Features of IC regulators - three terminal fixed voltage regulator IC's - typical circuits of LM 78XX and LM 79XX - adjustable voltage regulator LM 317 - dual power supply using LM 320 and LM 340 - features of LM 723 voltage regulator - functional block diagram of LM 723 - basic low voltage and

high voltage regulator circuits using LM723 - block diagram of SMPS - advantages and disadvantages - opto-couplers - principle of operation - IC 4N35.

MODULE 9 (10 marks)

Digital Communication

Pulse Modulation : Sampling theorem and its significance - Pulse modulation- PAM, PWM, PPM – modulation and demodulation. Model of a Digital Communication system -Basic Elements of PCM— Quantization-- Noise in PCM--Non uniform quantization—Companding -Differential PCM-- Delta Modulation--Noise in Delta Modulation--slope overload and granular noise Adaptive Delta modulation.

Digital Carrier Modulation :Introduction--Elements of Band Pass Data Transmission system -BFSK- Generation and detection. BPSK Generation and detection, Spectrum and bandwidth QPSK – Spectrum - MSK- Gaussian Minimum Shift Keying.

MODULE 10 (10marks)

Microcontrollers and Embedded systems

Assembly language programming of 8051 - addressing modes - instruction set - simple programs (program for addition, multiplication, division, data transfer, subtraction, port reading/writing) - interrupts in 8051 - interrupt types - steps in interrupt processing - IE special function register - IP special function register - priority of interrupts. Interfacing with 8051 - LCD system - 4x4 keyboard - ADC and DAC - stepper motor - dc motor - water level indicator system - temperature control system.

AVR assembly language programming - data transfer - arithmetic and logic instructions - shift and rotate instructions - branch instructions and looping - call instructions and stack - time delay and instruction pipeline - delay calculation - I/O port programming in AVR - simple assembly language programs - macros - comparison with subroutines.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper