

**DETAILED SYLLABUS FOR THE POST OF WORKSHOP  
INSTRUCTOR/INSTRUCTOR GR.II/DEMONSTRATOR IN ELECTRONICS  
ENGG.) (TECHNICAL EDUCATION)**

(Cat.No. : 677/2022)

(Total Marks- 100)

**1. Semiconductor Diodes (10 Marks)**

Energy band diagram of conductors, insulators, semiconductors, intrinsic & extrinsic semiconductors, doping, P&N type, majority & minority carriers. PN junction, drift & diffusion current, depletion layer, potential barrier, PN junction under forward & reverse bias, break down on diodes, Zener & avalanche breakdown. VI characteristic of PN junction diode, static and dynamic resistance, Different types of diodes – power, Zener, varactor and tunnel diodes - p-n junction diode, DC load line analysis, Half-wave rectifier, Full-wave rectifier, Bridge rectifier, Capacitor filter circuit, Zener diode- Regulator circuits.

**2. Basic Electrical: (10 Marks)**

superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem and maximum power transfer theorem -fundamentals of alternating current -waveform, time period, frequency and amplitude, phase difference, R.M.S value, average value- A.C. through resistors, inductors and capacitors - Q-factor of a coil- resonance circuits - R-L-C -Series & parallel circuits - inductive reactance, capacitive reactance and impedance - line voltage and current, phase voltage and current in 3 Ø system- star & delta connections. Transformer-Losses in transformers- Auto transformer- power transformers - DC generator - emf equation of DC generator- DC shunt generator - commutator in DC machines - DC motors - Fleming's left hand rule, shunt, series, compound motors - speed control using field control and armature voltage control - Alternators - relationship between frequency and number of poles- 3 phase induction motor- case and slip ring induction motors - starting of AC Motors - 3 phase induction motors- single phase induction motor, universal motor, stepper motor.

**3. Transistors: (10 Marks)**

CB Configuration - CE configuration, current relation (Collector current in terms of base current & leakage current-Input & output characteristics, determination of input & output resistance. CC configuration – expression of emitter current in terms of base current and leakage current Comparison of CB, CE & CC, current gain, voltage gain & leakage current.

Transistor biasing techniques – DC load line – Fixing the operating point, Need for stabilization. Different biasing methods – Working of a single stage CE transistor amplifier.

JFET, P-channel and N-channel- FET- comparison with Bipolar Transistor-advantages and disadvantages - parameters of JFET - MOSFET -types - depletion and enhancement modes- UJT, VI characteristics – SMD- types of opto-electronic devices - photo resistors, photodiodes, phototransistors, photovoltaic cells, LEDs, LCDs, and Opto-couplers. Power electronics: UJT, FET, Principle and operation of JFET, Parameters of JFET- MOSFET, Depletion MOSFET, Enhancement MOSFET, Difference between JFET & MOSFET SCR, diac, triac, UJT, different commutation circuits, dc motor drives, LVDT, induction heating, di electric heating SCR - Integrated circuit technology- SMD, advantages.

Power supply – Voltage regulations – Line Regulation – Load regulation – Shunt voltage regulator – Series voltage regulator – Fixed and Variable power supplies – Protection circuits – Current Limiting – Fold Back limiting. SMPS- UPS different type – Online and off line.

#### **4. Electronic measuring instruments: (10 Marks)**

Analog, digital meters, Wheatstone bridge, Q meter, CRO, signal generator, recorders, analogue and digital meters, Data acquisition systems.

#### **5. Operational Amplifiers: (10 Marks)**

Differential amplifier – parameters of op-amp – virtual ground – Input offset voltage, input offset current, input bias current, output offset voltage, CMRR, slew rate – Characteristics of ideal and actual op-amp – inverting amplifier, non-inverting amplifier, voltage follower, comparator, difference amplifier, summing amplifier, integrators, differentiators – Zero crossing detector, positive and negative voltage level detector – Schmitt trigger, window detector, logarithmic amplifier, antilog amplifier, Instrumentation amplifier – DAC and ADC: R-2R ladder type D to A converter, Counter type, dual slope integration and successive approximation type ADCs, Flash ADC – Half wave and full wave precision Rectifiers – Active filters – LPF, HPF, BPF filters – RC phase shift and Wien bridge oscillators, Astable and Monostable Multivibrators, Triangular wave generator – PLL principle of operation, lock range, capture range – Applications of PLL, VCO – LM 555 Timer – IC 555 – working principle – Monostable and Astable multivibrators using IC 555.

#### **6. Oscillators: (10 Marks)**

Barkhausen criterion for oscillation – working of RC oscillators – RC phase shift oscillator and Wein bridge oscillator – LC oscillators – Hartley and Colpitt's oscillators – crystal oscillator – Multivibrators – Bistable multivibrator – synchronous and asynchronous methods of triggering – monostable multivibrator using transistors – triggering methods of monostable multivibrators – operations of astable multivibrators using transistors – operation of Schmitt trigger circuit – UTP and LTP

#### **7. Digital Electronics: (10 Marks)**

Number Systems: Decimal Number System, Binary Number System, Converting Decimal to Binary, Hexadecimal Number System: Converting Binary to Hexadecimal, Hexadecimal to Binary, Converting Hexadecimal to Decimal, Converting Decimal to Hexadecimal, Octal Numbers: Binary to Octal Conversion. decimal, binary, octal, hexa decimal systems, gray code, BCD code,

Boolean algebra, Switching and Logic Levels, Boolean Algebra Theorems, De Morgan's theorem. Logic gates, NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate, Half adder, Full adder, Flip-Flops : RS Flip-Flop, Gated Flip-Flops, JS Flip Flops,

Counters, shift registers. Microcontroller: 8051 Architecture, features, flag registers, general purpose registers.

Logic families SSI, MSI, LSI, VLSI and ULSI – positive and negative logic – TTL and Schottky TTL, TTL inverter, Emitter Coupled Logic, CMOS logic family, features of CMOS logic gates, VIL, VIH, VOL, VOH, noise margin, noise immunity, propagation delay, current sourcing and current sinking, fan in, fan out, power dissipation.

Semiconductor memory –

ROM and RAM – working of ROM – working of dynamic memory – Compare Static RAM, Dynamic RAM, Flash ROM and NVRAM – SD RAM and EDO RAM – secondary memory – Optical memory – Magnetic bubble memory

### **8. Television: (10 Marks)**

luminance, chrominance, compatibility, additive and subtractive mixing of colours –Colour TV camera- working, Delta gun, Trinitron colour picture tubes. Basic Colour TV systems – NTSC, SECAM and PAL system - Advantages and disadvantages of one over the other – PAL D-Coder-Frequency interleaving- PAL-D Colour TV Receiver – AFT-Colour encoder Colour killer - Colour controls, HDTV- Digital TV. NTSC, PAL, SECAM modes of transmission, Satellite TV receiving system – Antenna, LNA, LNB, FEC- Digital satellite receiver, CCTV, MATV, CATV systems.- Video recording – VHS and U-matic formats, VCD, DVD, MPEG.

### **9. Communication Systems: (10 Marks)**

EM waves, propagation of EM waves, Modulation: Amplitude Modulation, Frequency Modulation, Phase modulation, AM Detection, FM detection, Super hetero dyne receiver system, bandwidth requirements, PAM, PCM, , ASK,FSK, BPSK, QPSK, Offset PSK, BFSK, MSK.Noise in communication systems, different types of noise, signal to noise ratio, methods to improve signal to nose ratio. Antenna: Physical concepts of radiation of electromagnetic energy and radiation pattern, point source, gain, power gain, directivity, aperture, effective area, radiation pattern, beam width, radiation angle, radiation resistance. Types of Antennas -Half wave dipole, folded dipole, Yagi-Uda antenna, Marconi antenna, rhombic antenna, parabolic antenna, Antenna arrays – End fire array and broadside antenna.

### **10. Microcontroller; (10 Marks)**

Features – Architecture of 8051 – Memory organization – Program memory – Data memory - Internal RAM structure – B register, Accumulator, Register Banks – Bit addressable area – Special Function registers – Program Status Word – Flags – Architecture of Ports, Timer / Counter – Different modes – Serial communication port – different modes – SBUF –Interrupts- External ROM and RAM interfacing – Addressing Modes.

***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***