SYLLABUS FOR COMPUTER BASED RECRUITMENT TEST (CBRT) FOR THE POST OF ASSISTANT PROFESSORS IN ELECTRICAL AND ELECTRONICS ENGINEERING UNDER DIRECTORATE OF TECHNICAL EDUCATION (GOA COLLEGE OF ENGINEERING) (Advt No. 08 Year 2021)

I. General English including Grammar   **- 05 marks**

II. General Knowledge, Current Affairs and Events of National and International Importance   **- 10 marks**

III. Logical Reasoning and Analytical Ability   **- 10 marks**

IV. Core: - 50 marks

Electric Circuits Analysis: Sources, methods of network solution, network theorems, time-domain and S-domain analysis of networks (RC,RL,RLC,LC etc.), real, reactive, apparent, complex powers, power factor, phasor analysis and phasor diagram, sinusoidal steady state analysis, power analysis of AC circuits, balanced and unbalanced three-phase networks, magnetic circuits and its analysis, transformers, series and parallel resonance networks, frequency response analysis of networks, network topology, two-port networks.

Analog and Digital Electronics: Diode circuits: rectifiers, clipping, clamping; BJT and MOSFET amplifiers, thermal runway in MOS amplifiers, cascade stages and current mirrors, MOS differential pair, small and large signal analysis, differential pair with active loads, feedback amplifiers, operational amplifiers: summing amplifier, differential amplifier, instrumentation amplifier, Schmitt trigger, comparators, integrators, differentiators, peak detectors, sample and hold circuit, precision rectifier, generation of sine wave, triangular wave, sawtooth wave, active filters, 555-timer circuits: astable multivibrator, monostable multivibrator, voltage regulators, VCO, phase locked loop
Number systems, binary codes, error detecting and correcting codes, logic gates, arithmetic circuits, K-map, combinational logic circuits, encoder/decoder, MUX/DEMUX, sequential logic circuits, latches and flip-flops, multiplexers, de multiplexers, ADCs, DACs; Microprocessor: architecture, machine instructions and addressing modes, ALU, data-path and control unit, instruction pipelining, interfacing memory, input-output devices

Electromagnetics: Coulomb's law and field intensity, electric fields and potential due to point/line/plane/spherical charge distributions, electric flux density, effect of electric medium, capacitance, Gauss's law, Poisson's and Laplace's equations, uniqueness theorem, Faraday's Law, Lorentz Law, Maxwell's equations, wave propagation, plane waves and its properties, Biot-Savart's Law, Ampere's circuit law, inductance, mmf, reluctance, magnetic circuits, self and mutual inductance of simple configuration, transmission lines

Electrical and Electronics Measurements: General principles of measurement, calibration, error analysis and its characteristics, DC and AC potentiometers, DC and AC bridges, measurement of voltage, current, power, energy and power factor; instrument transformers, digital voltmeters and millimeters, phase, time and frequency measurement; cathode ray oscilloscopes

Electrical Machines: Principles of electromechanical energy conversion, singly and doubly excited magnetic field systems, torque production in rotating machines, D.C. Machines (Generators and motors): construction, principle, operation, characteristics, testing, applications, Transformers (1-Ø and 3-Ø transformers): construction, principle, operation, characteristics, applications; Induction Motors (1-Ø and 3-Ø)**:** construction, principle, operation, characteristics, applications; Synchronous motor: construction, principle, operation, characteristics, applications, losses and efficiency computations of machines.

Signals and Systems: Continuous-time and discrete-time signals, transformation of independent variables, basic signals, systems and its properties, convolution integral, Laplace and inverse Laplace transform, Fourier series representation, Fourier and inverse Fourier Transform, Sampling theorem, discrete-time signals and systems, difference equation, convolution sum, correlation, z-transform and inverse z-transform, solution of difference equation, stability analysis, correlation, DTFS, DTFT and inverse DTFT, DFT and IDFT, FFT and IFFT, IIR and FIR filter, random variables and its analysis.

Analog Communication: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers

Control Systems: Open loop and closed loop systems, mathematical modeling of physical systems, transfer functions, block diagram and signal flow graphs to find transfer function, transient and steady state analysis of linear time invariant systems,, control system components, stability analysis using Routh-Hurwitz criterion, root locus, gain margin and phase margin, Bode plot, Polar plot, Nyquist plot, design of compensators/controllers (lead, lag, lead-lag compensation, P,PI, PID , state space model and its solution for LTI systems, observability and controllability

Power Electronics: Features of power processing unit, scope and applications, performance indices, power electronic components: static and dynamic v-I characteristics, switch realization, DC-DC converters: basic, isolated and non-isolated topologies, principle, operation, characteristics, applications, Resonant converters: principle, operation, characteristics, applications; Inverters (1-Ø and 3-Ø): principle, operation, characteristics, applications, Rectifiers (1-Ø and 3-Ø): principle, operation, characteristics, applications; VSI;CSI

Power Systems: Basic concepts of electrical power generation, AC transmission concepts, models and performance of transmission lines and cables, corona, and radio interference, economic load dispatch (with and without considering transmission losses), series and shunt compensation, electric field distribution and insulators, distribution systems, Per-unit calculations, bus impedance and admittance matrix, Gauss- Seidel, Newton-Raphson and fast decoupled load flow methods, voltage and frequency control, power factor correction, symmetrical components, symmetrical and unsymmetrical fault analysis, principles of over-current, differential, directional and distance protection, circuit breakers, system stability concepts, equal area criterion, HVDC transmission and FACTS concepts, distributed generation, solar and wind power, fundamental of power economics.

Note:

Duration for C.B.R.T :   **90 Minutes**

Maximum Marks for C.B.R.T : 75 Marks