FURTHER DETAILS REGARDING MAIN TOPICS OF PROGRAMME NO. 05/2016 (Item No. 3)

ASSISTANT PROFESSOR IN ELECTRONICS & COMMUNICATION ENGINEERING

TECHNICAL EDUCATION (ENGINEERING COLLEGES)

(CATEGORY No. 540/2014)

Part I : General Knowledge, Current Affairs & Renaissance in Kerala

Salient Features of Indian Constitution
Salient features of the Constitution - Preamble- Its significance and its place in the interpretation of the Constitution.
Fundamental Rights - Directive Principles of State Policy - Relation between Fundamental Rights and Directive Principles - Fundamental Duties.
Executive - Legislature - Judiciary - Both at Union and State Level. - Other Constitutional Authorities.
Centre-State Relations - Legislative - Administrative and Financial.
Services under the Union and the States.
Emergency Provisions.
Amendment Provisions of the Constitution.

Social Welfare Legislations and Programmes
Social Service Legislations like Right to Information Act, Prevention of atrocities against
Women & Children, Food Security Act, Environmental Acts etc. and Social Welfare Programmes like Employment Guarantee Programme, Organ and Blood Donation etc.

RENAISSANCE IN KERALA

Towards A New Society
Introduction to English education - various missionary organisations and their functioning- founding of educational institutions, factories.printing press etc.

Efforts To Reform The Society

(A) Socio-Religious reform Movements
SNDP Yogam, Nair Service Society, Yogakshema Sabha, Sadhu Jana Paripalana Sangham, Vaala Samudaya Parishkarani Sabha, Samathwa Samajam, Islam Dharma Paripalana Sangham, Prathyaksha Raksha Daiva Sabha, Sahodara Prasthanam etc.

(B) Struggles and Social Revolts
Upper cloth revolts.Channar agitation, Vaikom Sathyagraha, Guruvayoor Sathyagraha, Paliyam Sathyagraha. Kuttamkulam Sathyagraha, Temple Entry Proclamation, Temple Entry Act .Malyalee Memorial, Ezhava Memorial etc.
Malabar riots, Civil Disobedience Movement, Abstention movement etc.

Role Of Press In Renaissance

Malayalee, Swadeshabhimani, Vivekodayam, Mithavadi, Swaraj, Malayala Manorama, Bhashaposhini, Mathnubhoomi, Kerala Kaumudi, Samadarsi, Kesari, AI-Ameen, Prabhatham, Yukthivadi, etc

Awakening Through Literature

Novel, Drama, Poetry, *Purogamana Sahithya Prasthanam, Nataka Prashtanam,* Library movement etc

Women And Social Change

Parvathi Nenmenimangalam, Arya Pallam, A V Kuttimalu Amma, Lalitha Prabhu.Akkamma Cheriyan, Anna Chandi, Lalithambika Antharjanam and others

Leaders Of Renaissance

Thycaud Ayya Vaikundar, Sree Narayana Guru, Ayyan Kali.Chattampi Swamikal, Brahmananda Sivayogi, Vagbhadananda, Poikayil Yohannan(Kumara Guru) Dr Palpu, Palakkunnath Abraham Malpan, Mampuram Thangal, Sahodaran Ayyappan, Pandit K P Karuppan, Pampadi John Joseph, Mannathu Padmanabhan, V T Bhattathirippad, Vakkom Abdul Khadar Maulavi, Makthi Thangal, Blessed Elias Kuriakose Chaavra, Barrister G P Pillai, TK Madhavan, Moorkoth Kumaran, C. Krishnan, K P Kesava Menon, Dr.Ayyathan Gopalan, C V Kunjuraman, Kuroor Neelakantan Namboothiripad,
Velukkutty Arayan, K P Vellon, P K Chathan Master, K Kelappan, P. Krishna Pillai, A K Gopalan, T R Krishnaswami Iyer, C Kesavan. Swami Ananda Theerthan , M C Joseph, Kuttippuzha Krishnapillai and others

Literary Figures

Kodungallur Kunhikkuttan Thampuran, KeralaVarma Valiyakoyi Thampuran, Kandathil Varghese Mappila. Kumaran Asan, Vallathol Narayana Menon, Ulloor S Parameswara Iyer, G Sankara Kurup, Changampuzha Krishna Pillai, Chandu Menon, Vaikom Muhammad Basheer. Kesav Dev, Thakazhi Sivasankara Pillai, Ponkunnam Varky, S K Pottakkad and others

GENERAL KNOWLEDGE AND CURRENT AFFAIRS

General Knowledge and Current Affairs

Part II (a) Engineering Mathematics

Matrices: Rank, systems of linear equations, consistency, eigen values, eigen vectors, Cayley Hamilton Theorem, diagonalisation, linear dependence and independence of vectors.

Partial Differentiation: Partial derivatives, Euler's theorem on homogeneous functions, total derivatives, Jacobians, Taylor's series (one and two variables) – Maxima and minima of functions of two variables – Lagrange's method.

Vector Differentiation: Scalar and vector functions, differentiation of vector functions – velocity and acceleration – scalar and vector fields – operator ✖ – Gradient – Directional derivative – Divergence – Curl – irrotational and solenoidal fields – scalar potential.

Laplace Transforms: Transforms of elementary functions, shifting property – inverse transforms – transforms of derivatives and integrals – transform of functions multiplied by t and divided by t – convolution theorem, solution of ordinary differential equations with constant coefficients using Laplace transforms.

Ordinary Differential Equations: First Order ordinary differential equations, systems of linear first order ordinary differential equations, linear ordinary differential equations of higher order with constant coefficients, linear second order ordinary differential equations with variable coefficients (Cauchy and Legendre equations), Method of Laplace transforms for solving ordinary differential equations.

Complex Analysis: Analytic functions, conformal mappings, bilinear transformations, complex integration, Cauchy's integral theorem and formula, Taylor and Laurent's series, residue theorem.

Fourier Series: Fourier series of periodic functions of period 2π and 2ℓ, odd and even functions, Half range expansions.

Part II (b) Basic Civil Engineeering

Mechanics – statistics – Coplanar forces – conditions of equilibrium. Support reactions – Simply supported and overhanging beams. Friction – Laws of friction – applications. Centre of gravity and moment of inertia of plane areas. Dynamics – rectilinear motion – Newton's laws of motion – curvilinear motion.
Building materials – common building materials – stone, brick, cement, steel, aggregate, concrete, timber – properties, IS specification. Building construction – types and functions of the following structural components of buildings – foundations and superstructure.
Surveying – principle of surveying – linear measurements using chain – levelling work – reduction of levels.

Part II (c) Basic Mechanical Engineering

Zeroth, first and second laws of thermodynamics, CI and SI Engines, properties of steam. Centrifugal and reciprocating pumps, hydraulic turbines, refrigeration and air conditioning, hydro-electric, thermal and nuclear power plants, mechanical power transmission systems such as belt, rope, chain and gear, manufacturing process – casting, forging, rolling, brazing, soldering, and welding, machining process – turning, shaping, drilling, grinding and milling. Conic sections and miscellaneous curves, orthographic, isometric and perspective projections.

Part III (a) Basic Electrical Engineering

Ohm's law, Kirchoff's laws – solution of series and parallel circuits with dc excitation.
Magnetic circuits: MMF, field strength, flux density, reluctance, electromagnetic induction, Faraday's laws, Lenz's law, statically and dynamically induced emfs, self and mutual induction, co-efficient of coupling.

Principle of generation of alternating current – waveforms – frequency, period, average and rms values, form factor.

Generation of 3 phase ac voltage, star and delta connections, voltage & current relationships in star and delta (balanced system only).

Principle of operation of dc motor & generator, single phase transformer and three phase induction motor.

Types of lamps, necessity of earthing.

Part III (b) Basic Electronics Engineering

Devices – working principle of PN junction, Zener diode and BJT.

Systems – Rectifiers : Half wave, Full wave and Bridge. Filters: Capacitors and Inductors.

Amplifiers & Oscillators – Common Emitter RC coupled amplifier and its frequency response. Principles of Wein-bridge oscillator. Op-amps: Basics, inverting and non-inverting amplifier.

Communication – Need for modulation, principles of AM and FM.

Measurements – Working principles of CRO and Multimeter.

Part III (c) Basic Computer Science

Functional units of a computer.

Programming in C – control structures, functions.

Part IV (a): Networks and Devices

Network theorems: superposition, Thevenin and Norton's maximum power transfer, time domain analysis of simple RC, RL and RLC circuits, solution of network equations using Laplace transform: frequency domain analysis of RL, RC and RLC circuits, 2-port network parameters: driving point and transfer functions.

Electronic Devices: Energy bands in silicon, carrier transport in silicon, diffusion current, drift current, mobility and resistivity, generation and recombination of carriers, working principles of p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOSFET, LED and photo diode.

Part IV (b): Analog and Digital Circuits

Simple diode circuits: clipping & clamping, biasing and bias stability of BJTs and MOSFETs, small signal equivalent circuits of BJTs and MOSFETs. Amplifiers: single stage, differential, feedback and power. Frequency response of amplifiers. Op-amp circuits: Inverting, non-inverting, Integrator and Comparator. Sinusoidal Oscillators: criterion for oscillation, single transistor and op-amp configurations.

Boolean algebra, minimization of Boolean functions, logic gates, combinational Circuits: arithmetic circuits, code converters, multiplexers and decoders, sequential circuits: latches and flip-flops, counters and shift registers, ADCs and DACs, microprocessor (8085): architecture and programming.

Part IV (c) : Signals and Systems

Introduction to signals and systems, Linear Time-invariant (LTI systems): definitions and properties, causality, stability, impulse response and convolution, continuous-time

and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform Z-transform: definition, properties and inverse, stability analysis using pole-zero plot, difference equation solution using unilateral Z-transform, DFT and its properties, FFT: radix 2 and composite radix algorithm, sampling theorem, realization of IIR and FIR structures – parallel and cascade structure, frequency response, group delay and phase delay, signal transmission through LTI systems.

Part IV (d) : Electromagnetics and Control Systems

Elements of vector calculus: divergence and curl, Gauss and Stokes theorems, Maxwell's equations, differential and integral forms, wave equation, Poynting vector, Plane waves: propagation through various media, reflection and refraction, phase and group velocity and skin depth, Transmission lines: characteristic impedance, impedance transformation. Waveguides: modes in rectangular waveguides, boundary conditions, cut-off frequencies and dispersion relations, basics of propagation in dielectric waveguide and optical fibres, basics of Antennas: Dipole antennas, radiation pattern, antenna gain.

Introduction to control systems, signal flow graphs and their use in determining transfer functions of systems, transient and steady state analysis of LTI control systems and frequency response, tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots.

Part IV (e): Communication and Instrumentation

Analog communication systems: amplitude and angle modulation and demodulation systems, superheterodyne receivers, signal-to-noise ratio (SNR). Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes, matched filter receivers, fundamentals of information theory and channel capacity theorem, random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density.
Static and dynamic characteristics of Measurement systems: Measurement of displacement, velocity and acceleration, force, basics of fiber optics, biomedical instruments, EEG, ECG and EMG, Clinical measurements, ultrasonic transducers.

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.