DETAILED SYLLABUS FOR THE POST OF

NON VOCATIONL TEACHER (SENIOR &JUNIOR) IN PHYSICS

KERALA VOCATIONAL HIGHER SECONDARY EDUCATION,

HIGHER SECONDRY SCHOOL TEACHER (JUNIOR)IN HIGHER SECONDARY EDUCATION

(Cat. No.: 267/2021,271/2021,741/2021)

(Total – 100 Marks)

1- Classical Mechanics (7 Marks)

Constraints and Generalized coordinates, D'Alemberts principle and Lagrange's equation, Velocity dependent potentials, Hamilton's Principle, Lagrange's equation from Hamilton's Principle, Kepler problem, Hamilton -Jacobi equation, Hamilton‟s principal and characteristic function, H-J equation for the linear harmonic oscillator, Euler angles, Centrifugal and Coriolis forces, Nonlinear oscillations, Limitcycles, Chaos - Logistic map.

2- Mathematical methods and group theory (7 Marks)

Properties of Fourier series, Fourier integral, Fourier transform, Gamma function, Beta function, Delta function, Bessel functions of the first and second kinds, Neumann function, Spherical Bessel function, Legendre polynomials, Generating function, Recurrence relation, Rodrigues formula, Orthogonality, Associated Legendre polynomials, Spherical harmonics, Hermite polynomials, Laguerre polynomials, Cauchy-Reimann conditions, Cauchy's integral theorem and integral formula, Laurent expansion, Singularities, Calculus of residues and applications.

3- Electronics and Microprocessor (7+7 = 14 Marks)

a) Electronics (7 Marks)

Biasing of Field effect Transister (FET), FET as VVR and its applications, Photodetectors - Light dependent resistor- photodiode, p-n junction solar cells, Basic operational amplifier characteristics, differential amplifier, OPAMP parameters, OPAMP as inverter, Analog integration and differentiation, Electronic analog computation, Active low pass filter, High pass Butterworth filters, Band pass filter, OPAMP based astable and monostable multivibrators, Schmidt trigger. Amplitude modulation and demodulation circuits, Comparison of signal to noise ratios, Pulse code modulation, Communications receivers, FM transmitters, VHF/UHF systems, Microwave systems , Satellite communications.

b) **Microprocessor (7 Marks)**

Organization of microcomputers, microprocessor as CPU, Addition, Subtraction of two 8 bit & 16 bit numbers, Organization and internal architecture of the Intel 8085,Timings of Intel 8085, Data transfer schemes of Intel 8085, Applications of Microprocessors, Analog to Digital converter, Clock for A/D conversion, Sample and Hold circuit, Analog multiplexer and Overview of 8051 microcontroller.

4- Quantum Mechanics (7 Marks)

Vector spaces, The Hilbert space, Operators and its properties, Angular momentum operators, Matrix representation of angular momentum operators, Pauli spin matrices, Orbital angular momentum, differential and total cross-section, optical theorem, Harmonic perturbation, Interaction of an atom with the electromagnetic field, Induced emission and absorption, Anharmonic oscillator, stark and Zeeman effects in hydrogen, Hole theory, The Weyl equation. The Klein-Gordon equation, Charge and current densities.

5- Statistical mechanics (7 Marks)

The entropy of mixing and Gibbs paradox - Phase space of a classical system - Liouville‟s theorem and its consequences, Equipartition theorem - Virial theorem - The density matrix, Thermodynamic behaviour of an ideal Bose gas, Thermodynamic behaviour of an ideal Fermi gas- Magnetic behaviour of an ideal Fermi Gas : (1) Pauli paramagnetism, (2) Landau diamagnetism.

6- Nuclear and particle Physics (7 Marks)

Nuclear size, shape, mass and binding energy, semi empirical mass formula Characteristics of nuclear forces, spin-orbit potential, electric quadruple moments, parity violation in beta decay, internal conversion. Conservation laws and symmetries, Quark model, The eightfold way, quantum chromodynamics and gluons._, Fick‟s law and its validity, Shell structure and magic numbers, Single crystal and Powder diffraction, Scherrer equation, Debye-Scherrer Camera, Applications of XRD.

7-Solid State Physics (7 Marks)

Miller indices, Reciprocal lattice, Brillouin zones, Einstein and Debye models of specific heat, Nearly free electron model and formation of energy bands, Bloch functions, Kronig Penny model, Dielectric constant, Local Electric field, Ferroelectric domain, Antiferroelectricity, Piezoelectricity, Langevin‟s theory of diamagnetism, Weiss theory of ferromagnetism, Neel Model of

Antiferromagnetism, Type I and Type II superconductors, energy gap Isotope effect, London equation, Cooper pairs, High Tc Superconductors, Cuprates.

8-Atomic and molecular Spectroscopy (7 Marks)

The spectrum of non rigid rotator, Born –Oppenheimer approximation, Normal modes and vibration of H_2O and CO_2, Rotational Raman Spectrum of Symmetric top molecules, stimulated Raman effect and Inverse Raman Effect. Vibrational Analysis of band systems, Deslander‟s table, Interaction of nuclear spin and magnetic field, Larmour precession, Mossbauer Spectroscopy, Resonance fluroscence of γ-rays.

9- Lasers and fibre Optics (7 Marks)

Einstein coefficients, Line-broadening mechanisms, Q-Switching, Mode locking, Four level solid state lasers, CO2 lasers, Dye lasers, Semiconductor lasers, Spatial frequency filtering and holography, Second Harmonic Generation. Acceptance angle of Optical Fibre, Numerical aperture of optical fibre, Step-index fibers, Graded index fibers. Attenuation in optical fibers, Absorption losses, Leaky modes, Radiation induced losses, Inherent defect losses.

PART II (10 Marks)

RESEARCH METHODOLOGY/TEACHING APTITUDE

I. <u>TEACHING APTITUDE</u>

- Teaching: Nature, objectives, characteristics and basic requirements;
- Learner's characteristics;
- Factors affecting teaching;
- Methods of teaching;
- Teaching aids;
- Evaluation systems.

II. <u>RESEARCH APTITUDE</u>

- Research: Meaning, Characteristics and types;
- Steps of research;

- Methods of research;
- Research Ethics;
- Paper, article, workshop, seminar, conference and symposium;
- Thesis writing: its characteristics and format.

PART III (10 Marks)

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.

PART IV (10 Marks)

GENERAL KNOWLEDGE, CURRENT AFFAIRS AND RENAISSANCE IN KERALA

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 Varghesc 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

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

Syllabus

(Total – 28 Marks)

6- Nuclear and particle Physics (7 Marks)

Nuclear size, shape, mass and binding energy, semi empirical mass formula Characteristics of nuclear forces, spin-orbit potential, electric quadruple moments, parity violation in beta decay, internal conversion. Conservation laws and symmetries, Quark model, The eightfold way, quantum chromodynamics and gluons._, Fick‟s law and its validity, Shell structure and magic numbers, Single crystal and Powder diffraction, Scherrer equation, Debye-Scherrer Camera, Applications of XRD.

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