

**FURTHER DETAILS REGARDING MAIN TOPICS OF  
PROGRAMME NO. 04/2016 (Item No. 17)**

**INSPECTOR OF FACTORIES & BOILERS  
GRADE II**

**FACTORIES & BOILERS**

**(CATEGORY No. 231/2015)**

**Part Ia : Thermodynamics and Fluid Mechanics**

Thermodynamic processes, entropy, irreversibility and availability, basic thermodynamic cycles, behaviour of ideal and real gases, properties of pure substances, computation of work and heat, ideal processes, analysis of thermodynamic cycles related to energy conversion.

Fluid mechanics: Fluid properties, fluid statics, manometry, buoyancy, control volume analysis of mass, momentum and energy, fluid acceleration, differential equations of continuity and momentum. Euler's equation, Bernoulli's equation, laminar flow through pipes, boundary layer displacement, momentum and energy thickness, flow through pipes, minor and major losses, dimensional analysis.

Heat transfer: Modes of heat transfer, one dimensional heat conduction, thermal resistance, fins, free and forced convective heat transfer, dimensionless parameters, problems in convective heat transfer with the help of correlation, thermal boundary layer, radiation, black and grey surfaces, shape factors, network analysis.

Mechanics of Solids: Stress-strain relationship and elastic constant, principal stress and strains, Mohr's circle for plane stresses and plane strains, shear force and bending moment diagrams, bending of beams, torsion of circular shafts, Euler's theory of columns, strain energy, thermal stresses.

**Part Ib : Theory of Machines**

Kinematic and dynamic analysis of planer mechanisms. Cams, Gears and gear trains. Flywheels, Governors, Balancing of rigid rotors and field balancing, Balancing of single and multi cylinder engines, free and forced vibrations of single degree of freedom systems, effect of damping, vibration isolation and transmissibility, resonance, Critical speeds and whirling of shafts.

Design for static and dynamic loading, failure theories, fatigue strength and S-N diagram, Principles of design of machine elements such as bolted, riveted and welded joints. Design of shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

**Part Ic : I.C. Engines and Refrigeration**

SI and CI engines, two-stroke and four-stroke engines, efficiencies, heat balance, combustion in IC engines, abnormal combustion, engine fuels and fuel rating,

alternate fuels, carburetion and fuel injection – MPFI, CRDI, super charging and turbo charging methods, engine emission and control. Steam and gas turbines, Rankine and Brayton cycles with regeneration and reheat, heat transfer equation, heat exchangers – LMTD and NTU methods, vapour compression and absorption refrigeration cycles, heat pumps, properties of moist air, psychrometric chart, basic psychrometric processes, turbo machines – impulse and reaction principles, Pelton wheel, Francis and Kaplan turbines, velocity diagram and performances of turbo machines, non-conventional energy sources – solar, wind, wave, biomass, geothermal and fuel cells.

### **Part Id : Manufacturing Science and Processes**

Classification of materials, Structure and properties of common engineering materials, Crystalline materials, crystal structure, defects in crystals, phase diagrams, iron-carbon equilibrium diagram, Phase transformation, T-T-T diagram, heat treatment, fracture – brittle and ductile materials, powder metallurgy.

Metal casting – sand casting, die casting, investment casting, centrifugal casting, gating and riser design, melting furnaces, forming – hot and cold processes, forging, drawing, extrusion, shearing, bending, high energy forming, joining processes – welding, weldability, metallurgy of welding, machining processes – single and multi point cutting tools, tool geometry and materials, mechanics of machining, tool life and wear, jigs and fixtures, unconventional methods, EBM, ECM, LBM, ultrasonic machining, computer integrated manufacturing, CNC machining, metrology and instrumentation – limits, fits and tolerances, accuracy, precision, repeatability, comparators, gauges, interferometry, surface structure, measurement of displacement, velocity, acceleration, temperature, Transducers.

### **Part Ie : Principles of Management**

Principles and functions of scientific management, Levels and skills of management, organisational structure – authority, responsibility and span of control – system concept of management – line, line and staff, project and matrix organizations, proprietary partnership and joint stock companies, private limited, public limited companies, cooperative organizations and Government organizations. Factors in selection of site, plant layout, types of layouts: process, product, fixed and group layouts. Marketing management – objectives and function, forecasting – moving average, exponential smoothing, break-even analysis, capacity planning, inventory control, ABC analysis, EOQ model, work study – Job evaluation and merit rating, Quality control, control charts for variables and attributes, acceptance sampling, TQM, SPC tools, ISO standards, linear programming – Graphical and Simplex solution methods, Transportation and assignment models, single server queuing models, network theory – CPM – crashing of networks, PERT – probability of completion.

## **Part II: 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, Al-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 Cheriyani, 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 Chavara, 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

***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.***