

# WORKSHOP INSTRUCTOR MECHANICAL

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## EXAM DETAILS



### METHOD OF RECRUITMENT

Direct

### AGE LIMIT

23-36

### QUALIFICATION:

Must possess a degree in Mechanical Engineering of a recognized University or equivalent qualification recognized by the central or state Government

### NAME OF POST

WORKSHOP INSTRUCTOR - MECHANICAL

### DEPARTMENT

MECHANICAL

### NUMBER OF VACANCY

02 (anticipatory)

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# EXPECTED SYLLABUS

## WORKSHOP INSTRUCTOR - MECHANICAL

### STRENGTH OF MATERIALS

Simple stress and strain, longitudinal strain, lateral strain, Poisson's ratio Hook's law, modulus of rigidity, shear stress shear strain relationship between elastic constants Friction, sliding friction, rolling friction, cone of friction, center of gravity, moment of inertia, shear force and bending moment- types of beams and Its loading conditions, shear force and bending moment diagrams and equations in different types of beams and different types of loads point load, uniform distributed load, cantilever beam simply supported beam deflection of beams, torsion of circular shafts solid and hollow shafts, power transmitted by shafts principle stresses Mohr's circle columns critical load equivalent length slenderness ratio.

### THERMODYNAMICS

Basic concepts and definitions, microscope and macroscopic approaches, definitions of heat and work, zeroth law of thermodynamics, temperature scales, first law of thermodynamic is, properties of pure substances, ideal gas Equation and other equations of state, second Law of thermodynamics, Kelvin Planck and Clausius statements, reversible processes and cycles, entropy, Inequality of Clausius, entropy changes in various thermodynamic processes, principle of increase of entropy, available and unavailable energy, availability function, availability and irreversibility open and closed systems, third Law of thermodynamics, general thermodynamic relations combined first and second law equation, Helmholtz and Gibb's functions Maxwell's relation equation for internal energy enthalpy and entropy ideal and real gases, Clapeyron equation throttling process joule Thomson coefficient inversion curve gas mixtures composition of a gas mixture, mass and mole fraction Dalton's law, Gibbs Daltons Law, equivalent molecular weight and gas constant properties of gas mixtures specific heats internal energy enthalpy and entropy.



## FLUID MECHANICS AND MACHINES

Properties of fluid density, specific weight, viscosity, surface tension, Bulk modulus, compressibility, rate of shear strain, Newton's law of viscosity, Newtonian and non-Newtonian fluids, real and ideal fluids, Incompressible and Compressible fluids, head pressure and its measurement, buoyancy and floatation, energies In flowing fluid, head-pressure, dynamic, static and total head, continuity equation, Euler's equation, Bernoulli's equation, flow rate measurements venturimeter and orifice meters, notches and weirs, pitot tube, Reynolds number, laminar and turbulent flow, Hagen- Poiseuille equation, turbulent flow through pipes, head loss due to friction, Darcy- weisbach equation, Chezy's formula, losses at entry, exit, sudden expansion and sudden contractions.

Impact of free jets stationary and moving vanes flat and curved vanes series of vanes, work done and efficiencies, draft tubes, cavitation, governing and specific speed of turbines, reciprocating pump air vessels cavitation slip, indicator diagram, work required and efficiency, centrifugal pump monometric head, work efficiency and losses, priming , specific speed, performance characteristics.

## THERMAL ENGINEERING

Steam engineering- Rankine cycle, boilers, boiler mountings, boiler accessories, steam nozzles. steam turbines, multistage turbines. IC engines Classification, air supply system, fuel supply system, ignition system, performance testing combustion in SI and IC engines, auto ignition, preignition, detonation, octane and cetane numbers anti knocking agents. Gas turbines -classification, regeneration intercooling reheating, efficiency and work output. Compressors classification of compressor, uses of compressors reciprocating compressor intercooler rotary compression fan and blowers. Refrigeration concept of COP, heat pump, unit of refrigeration, reversed carnot cycle refrigeration systems, refrigeration equipment and refrigerants. Psychrometric dry bulb temperature, wet bulb temperature, dew point temperature, psychrometric processes, air conditioning, air conditioning systems. Heat transfer conduction, through plane wall and composite wall black body concept Stefan boltzman law gray body concept newton rikhman equation free and forced convection. Heat exchange classification recuperator type and regenerative type parallel flow, counter flow type & cross flow concept of overall heat transfercoefficient LMTD. **Power plants hydro electric, thermal, diesel and nuclear plants.**



## THEORY OF MACHINES AND DESIGN OF MACHINE ELEMENTS

Definitions and basic concept kinematic and dynamic analysis of planer mechanisms. Belt rope chain drives open and cross belt drive, length of belt , ratio of belt tensions centrifugal tension, initial tensions V belt drive, rope drive, chain drive, power transmitted. Friction clutches plate clutches conical clutches. Brakes and dynamometers types of gears terminology, law of gearing, gear tooth profiles interference and under cutting calculation of minimum number of teeth, contact ratio path of contact arc of contact. Gear trains flywheels governors balancing of rigid rotors and field balancing balancing of single and multi cylinder engines free and forced 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 principle of design of machine elements such as bolted riveted and welded joints design spur gear rolling and sliding contact bearing brakes and clutches.

## PRODUCTION TECHNOLOGY

Foundry pattern moulding sand cores gating and risering chills chaplets gating systems, gravity die casting centrifuging continuous casting casting defects. Welding weld ability type of flames types of welding weld defects. Forming cold rolling hot rolling. Forging types of forging defects in forging extrusion hot and cold extrusion wire drawing, rotary swaging metal spinning metal cutting types of chips, tools signature tool geometry machinability tool wear cutting force in orthogonal cutting merchants attachments. Shaper cutting speed shaper operation and tools used. Milling machine milling cutters up milling down milling and face milling operations indexing. Drilling machine classification cutting speeds and feeds types of drill reamers . boring machines classification, machining time boring tools grinding machine surface unconventional machining processing EDM, ECG, ECM, LBM, USM, AJM, EBM and chemical machining powder metallurgy.

Metrology and instrumentation line standard limits fits, and tolerances allowance, accuracy precision repeatability sine bar, comparators gauges , interferometry, surface roughness, measurement of displacement, velocity, acceleration, temperature, transducers.



## INDUSRIAL ENGINEERING AND MANAGEMENT

Meaning of management, Taylor's scientific management functions of management, organizational structure, authority responsibility and span of control line, line and staff, functional, project and matrix organization. Formation of companies proprietary, partnership and joint stock companies, private limited, public limit companies. Cooperative organization and government organizations.

Work study analysis of work methods using different types of process chart and flow diagrams, critical examination, micro motion study and therbligs, SIMO chart, principle of motion economy, determination of allowance and standard time, job evaluation and merit rating, wage payment plans.

Production planning and control, importance of planning, forecasting techniques, job, batch and mass production control, routing, scheduling, dispatching and follow up, gantt charts, inventory models, determination of EOQ and reorder level, selective inventory process capability, statistical quality control, control charts for variables and attributes, acceptance sampling and operation characteristic curves, system reliability, life testing, bath tub curve.

Personal management – objectives and function, recruitment, selection, orientation and training of workers, industrial safety and health, labour welfare, industrial psychology, labour legislation.

Linear programming graphical and simplex solution methods, transportation and assignment problems, game theory, single server queuing models, network theory, CPM and PERT.



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