DETAILED SYLLABUS FOR THE POST WORKSHOP INSTRUCTOR / INSTRUCTOR GRADE II / DEMONSTRATOR / DRAFTSMAN GRADE II IN TOOL AND DIE ENGINEERING (TECHNICAL EDUCATION DEPARTMENT)

Cat No: 242/2023

(Total Marks- 100)

Module 1: Production Engineering (10 Marks)

Elementary ideas about various basic workshop practices of foundry, welding, smithy and Fitting and various tools using in each sections. Powder metallurgy.
Machine tools like lathe, shaper, planer, milling, drilling and slotting machines and its operations, Cutting tools, Tool materials, cutting speed, feed, depth of cut, tool nomenclature, tool life.

Module 2: Engineering Graphics & Tool Engineering Drawing (10 Marks)

First angle projection method and its symbol, projection of points and line in four quadrants, construction of various conic sections like ellipse, parabola and hyperbola, Development of surfaces, section of solids, Isometric and oblique projections.
Screw thread nomenclature, forms of thread, types of bolts and nuts, riveted joints, limit, fit and tolerances, surface texture and geometric tolerances in drawing.

Module 3: Strength of Materials & Material Science (10 Marks)

Simple stresses and strains, Hook's law, elastic constants, Factor of safety, linear stress strain, lateral stress and strain, Poisson's ratio, Thermal stress and strains, composite bar, Shear force and bending moments, torsion of shafts, thin and thick cylinders, Columns and struts.
Mechanical properties, crystal structures, ferrous metals and its alloys, iron and carbon steels, alloy steels, destructive and non-destructive testing, heat treatment processes, non-ferrous metals and its alloys.

Module 4: Fluid Mechanics (5 Marks)

Definition of fluid, properties of Fluid, Pascal's Law, Measurement of pressure, Total pressure, center of pressure, Buoyancy, Meta centre, Metacentric height, types of fluid flow, discharge, continuity equation, Euler's equation, Bernoulli's equation and applications, flow through Orifices, notches and weirs, water hammer, vapour pressure. Basic circuits in hydraulic and pneumatic systems.

Module 5: Moulds & Dies Technology (15 Marks)

Plastic materials and their properties, thermo and thermo setting plastics, injection moulding and injection moulding machine, terminology used in moulds, feed system, ejection techniques, cooling system, classification of moulds, compression moulding, transfer

moulding, extrusion moulding, blow moulding, rotational moulding, calendaring, vacuum forming, multi colour moulding. Die casting process, die casting machines, die casting alloys.

Module 6: Press Tool Technology (15 Marks)

Press machine parts, specification, classification and working. Press tool parts, terminology and operations like blanking, piercing, shearing, cropping, notching, lancing, coining, embossing, stamping, curling, drawing, bending and forming, types of dies and construction of various dies, pilots, strippers, knock outs, stoppers, gauges, fasteners and dowels in press tools, theory of bending, types of bending, fine blanking.

Module 7: Tool Design (10 Marks)

Die set types, Strip layout, cutting clearance, cutting force, strip layout percentage utilization, blanking force, bending stress, bending pressure, bending radius, bend allowance, blank development calculation in bending, calculation of drawing force, flat blank diameter, number of draws required, blank holding force calculation in drawing(basics only).
Runner diameter, gate size, shrinkage, temperature control in moulding, types of compression moulding, types of transfer moulding.

Module 8: Engineering Metrology (10 Marks)

Methods of measurements: direct & indirect, Terms applicable to measuring instruments: precision and accuracy, sensitivity and repeatability, range, threshold, hysteresis, calibration; errors in Measurements.
Measuring gauges including limit gauges, comparators, linear and angular measurements, vernier caliper, vernier height gauge and depth gauge, micrometer, vernier micrometer,bevel protractor, vernier bevel protractor, slip gauges, sine bar, clinometer, spirit level, auto collimator.

Module 9: Jigs & Fixtures (5 Marks)

Fool proofing, degrees of freedom, 3-2-1principle of location, types of locators, principles of clamping, types of clamping, jig bushings, drill jigs, types of fixtures like turning fixtures, milling fixtures, grinding fixtures etc.

Module 10: Modern Production Process (10 Marks)

Non-conventional Machining Processes like ultra-sonic machining, electric discharge machining, wire cut EDM, abrasive water jet machining, laser beam machining, electro chemical machining, NC and CNC machines, programming in CNC machines, part programming, computer integrated manufacturing, flexible manufacturing system.

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