DETAILED SYLLABUS FOR THE POST OF PUMP OPERATOR

MUSEUMS AND ZOOS (Cat. No.:490/2020)

(Total Marks ± 100)

Module 1 - Workshop Safety &Basic Workshop Practice (8 marks)

Workshop Safety

Occupational health and safety - safety practice personal safety and general precautions observed in the shop-types of fires- fire extinguishers -types of fire extinguishers - elementary first aid -handling of fuel spillage- safe handling and periodic testing of lifting equipments -energy conservation process

Basic Workshop Practice

Drilling machines - portable type drilling Machines - cutting speed and RPM -work holding devices- drill holding devices- drill bits - hand taps and wrenches -tap drill size - die and die stock - reamers - hole size for reaming - lapping - rivets types and uses -riveted joints - brazing -soldering -principles of arc welding ±arc welding machines - oxy-acetylene gas welding- air impact wrench- air ratchet - wrenches ±flaring- flare fittings and testing the joints-grinding machines ±types of grinding machines- uses of hoists,-jacks and stands-bearings and types.

Module 2- Workshop Tools and Equipments, Engineering Measurement (8 marks)

Workshop Tools and Equipments

Files -classification of files- Scrapers - surface plates -measuring tape -engineer's steel rule - try square- hacksaw blades and frames -types of calipers-dividers -surface gauges -scriber - hand tools -chisel -angles of chisels - hammers - wooden mallet -screwdrivers - allen keys -bench vice -types of vices ±C clamps and toolmaker's clamps - spanners and their uses -pliers - straight & bent snips-puller - anvil- jacks and types.

Engineering Measurement

Outside micrometer -depth micrometer- vernier calipers -universal vernier caliper and its application -telescope gauge- dial bore gauge -dial test indicators - straight edges - feeler gauge & uses- screw pitch gauge-wire gauges-vacuum gauge-pressure gauge.

Module 3- Basic Electrical (12 marks)

Conductors-insulators - semiconductors- EMF-potential difference-current and resistance- ohm's law -close circuit-open circuit -short circuit -AC and DC meters - connection of an ammeter in circuit -use of an ammeter-connection of a voltmeter- use of a voltmeter -connection of an ohmmeter- use of an ohmmeter -electric series circuits & parallel circuits-types of resistors, construction and power rating tolerance in resistors-resistor colour code- -resistance symbols used in wiring diagram- multimeters and digital multimeter- application of multimeter-electric soldering iron-necessity of earthing- system and equipment earthing -need of a fuse in the circuit -construction of a fuse -types of fuses -working of fuses -circuit breakers-capacitor -function of capacitor - units of capacitance- parallel and serial connection of capacitors±transformer- AC motors -DC motors ±AC generators -DC generators-starters and types.

Module 4- Basic Electronics,Battery(8 marks)

Basic electronics

semiconductors -P and N materials -property of a PN junction -classifications of diodes- uses of transistors - classifications of transistors -thyristor and characteristics of SCR -working of SCR- thermistor and its usage- relay -classification of relays-function of current sensing relay and voltage sensing relay -solenoid and its application- construction and symbol of UJT -application of UJT- bi polar transistors and field effect transistors- JFET construction and working- MOSFET's operation principle and types.

Battery

classification of cells-construction of a lead acid battery-chemical action during discharging and charging -testing of a lead adid battery -battery rating ±different battery charging methods -maintenance free battery- thermo couple- thermo electric energy- piezo electric energy.

Module 5 - Hydraulics and Pneumatics(10 marks)

Hydraulics

Pascal©law - concept of force multiplication-Hydraulic oils-functions of hydraulic fluids -viscosity- hydraulic systems-reservoir -external gear pump -internal gear pump- pumps and types-working of hydraulic pump-different types of hydraulic actuators-single-acting hydraulic cylinders ±double acting hydraulic cylinders -double rod end hydraulic cylinders-2/2-way directional control (DC) hydraulic valve -3/2 directional control (DC) hydraulic valve-4/2 directional control (DC) hydraulic valve-symbol and working of hydraulic DC

valves -symbol and working of non-return valve -symbol and working of an adjustable type throttle valve.

Pneumatics

Pneumatic System- Boyle©law -reciprocating piston compressor- FRL or air service unit- pneumatic actuators -valves in fluid power system - symbols for dc valves- working of pneumatic cylinders.

Module 6±I C Engines,Engine components (16 marks)

Engines

Internal and external combustion engine -classification of I.C. engines- basic technical terms used in relation to engines- two stroke engine -four-stroke engine- differentiate between a four stroke and a two stroke engine - OTTO cycle - diesel cycle - diesel engine- spark ignition engine-Direct and indirect fuel injection systems - starting and stopping methods of engine- petrol engine basics- scavenging.

Engine components

Construction of cylinder head -cylinder head design-types of cylinder heads-cylinder head gasket -gasket materials -cylinder block -construction of cylinder block - crankcase -cylinder liner -types of cylinder liners -material of cylinder liners-function of the valve -constructional features of valves -different types of valves and their material- types of valve operating mechanism -parts of the valve mechanism -valve seats -function of valve rotation -size of intake and exhaust valve -valve trains- valve timing -variable valve timing-function of the camshaft -construction and material of the camshaft-different types of camshaft drive mechanisms-piston -constructional features of a piston -different types of pistons- different types of piston rings ±construction of piston rings -material of piston rings- function of connecting rod -various types of piston pins- locking method and material of the piston pin- function of the crankshaft ±construction of crankshaft -material of crankshaft - crankshaft balancing -function of firing order-function of flywheel -construction of flywheel-functions of a vibration damper- timing gear drive- timing chain drive.

Module 7 - Cooling and Lubrication System (10marks)

Engine cooling system

Necessity of the cooling system- different types of cooling systems -forced type of cooling system- function of the water pump-radiator- temperature indicator-pressure cap -need and function of the thermostat valve- vapour recovery system -different types of thermostat valves- constructional features of a radiator

-temperature indicator-thermo switch-coolant properties -engine coolant changeinterval-anti Freeze mixtures.

Engine Lubrication system

Need of lubricating an engine- different types of engine lubricating systems-components of the pressure lubrication system - functions of lubrication system-function of pressure relief valve-types of the pressure relief valve -different types of crankcase ventilation- positive crankcase ventilation -oil level indicator-oil pressure indicator- oil pressure indicating light-oil pumps- gear type oil pump rotor type oil pump- vane type oil pump- plunger type oil pump-properties of lubricating oils-SAE oil grades.

Module 8-Intake &Exhaust Systems,Fuel System (10 marks)

Intake and exhaust systems

Intake system-Exhaust system-construction and operation of an air compressor -construction and operation of an exhauster-construction and operation of a supercharger-construction and operation of turbo charger - types of air cleaners - function of an air cleaner-inlet manifold -exhaust manifold ±purpose of mufflers- tail pipe-constructional features of the mufflers -different types of mufflers-gas turbines- sources of emission -different type of emission-emission control methods used in vehicles.

Fuel systems

specification and characteristics of fuel -different types of fuel system- petrol engine fuel system and components-Diesel Engine fuel systems- function of the fuel tank -part of fuel tank -function of fuel pipes -need of a fuel filter -types of fuel filter systems -need for bleeding the fuel system -function of water separators -function of a feed pump -construction of a feed pump -working of a feed pump- function of F.I.P -constructional features of F.I.P- need of calibration -types of fuel injection system need of a governor -types of governors -constructional features of governors -injectors-different types of injectors -glow plugs

Module 9 Transmission & Control systems (10 marks)

Transmission system

principle of clutch -need for a clutch - different types of clutch -function of the clutch -various types of clutch actuation systems- multiplate clutches -dry clutches - wet clutches ±semicentrifugal clutch -fully centrifugal clutch- fluid coupling-various types of gear shift mechanism-reasons for the gear slip-need of a gearbox- various resistances in vehicles motion-gear ratios -different types of gearboxes -sliding mesh gearbox -constant mesh gearbox -reasons for gear noise-

synchromesh gearbox -different types of synchromesh gearboxes -function of a synchromesh unit- power flow in different gear positions - layout of drive lines - front wheel drive -rear wheel drive.-transaxle function -function of the propeller shaft -Hotchkiss drive -torque tube drive- universal joint -different types of universal joints -slip joint- various types of axle housings -types of rear axles- function of the differential -transfer case -automatic transmission

Control systems

functions of the steering system -steering linkages -steering column-steering gear boxes -wheel alignment - suspension systems- shock absorber -types of shock absorbers - tyres- various types of brake systems -mechanical brakes- hydraulic brake -master cylinder- power-assisted hydraulic brakes -vacuum-assisted hydraulic brake -drum brake- disk brake -wheel cylinder- characteristics of brake fluid -air brake system- fail safe brake.

Module 10. Electrical& Electronics systems, Accessories (8 marks)

Electrical & Electronics systems

Electrical circuits in automobiles -ignition circuit -ignition coils -sparkplugs -need of a distributor -constructional features of the distributor -types of advance mechanism -principle of electronic ignition system- ECM -pulse generator -hall effect sensor -electronic spark advance -distributor less ignition system-MPFI state the main components of MPFI -working principle MPFI-engine management system -sensor used in EFI-principle of alternator -functions of the various parts of an alternator -working of an alternator- starting system -principle of starting motor -construction of starting motor -operation of bendix drive -operation of over running clutch drive -sliding armature drive.

Electrical Accessories

Various gauges in a vehicle -fuel gauge -oil pressure gauge - different type of meters and their uses -warning lights- lighting circuit-air conditioning system-working of an air-conditioner horn circuit - types of horn -wiper wiring circuit and operation -power window-air bag & seat belt-GPS.

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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.