

**DETAILED SYLLABUS FOR MECHANIC IN AGRICULTURE DEVELOPMENT AND
FARMER'S WELFARE DEPARTMENT**

(Category No. 545/2019)

PART I : FITTER (50 Marks)

Module-I

5 Marks

MARKING AND MARKING TOOLS

Marking media- Linear measurement –Scribers-Dividers –Datum- Calipers- Types of marking punches-Surface gauge- V' Blocks- Surface plate- marking off table-Angle plates- parallels and Combination set

Module-II

5 Marks

HAND TOOLS AND MEASURING TOOLS

Hammers- Types of vice-C clamp- types of Spanners-pliers-screw driver-Types of Steel rules- Try square and its types -jenny caliper-straight edge-system of units -Measurements of angles-Angular measuring instruments (Semi - precision) -Measuring standards (English & metric)

Module-III

5 Marks

CUTTING TOOLS AND OPERATIONS

Elements of a file- Cut of files –Grades-shapes- - Types of files- Needle files- Special files- Pinning of files -Care and maintenance -Convexity of files- Filing techniques- Hacksaw frames and blades- types of chisels-scraper-drilling-types of drills-drilling machines-reamers –hand taps-threading dies- Drilling - Cutting speed, feed and r.p.m - drill holding devices -Counter sinking-Radius/Fillet gauge, feeler gauge- grinding-standard grinding wheel marking system-grinding machines.

Module-IV

5 Marks

PRECISION INSTRUMENTS

Micrometers –dial calipers- Vernier calipers -Vernier height gauge- types- working principle- vernier bevel protractor-comparator-measuring errors,Guages-types-slip gauges-angle gauge-sinbar-, Jigs and fixtures- Limits and fits-interchangability-tolerance-allowances-shaft and hole basis system.

Module-V

5 Marks

FASTENERS AND POWER TRANSMISSION

Types of screw threads-fasteners-keys-bolts-washers-studs-setscrews-cotters-pins-couplings-circlips-soldering-brazing-rivetting-types of rivets-defects in rivetting-taper-springs

Belt and belting-belt fastenings-slip-creep-crowning-dressing-types of gears-clutches-bearings types-bearing materials

Module-VI

5 Marks

METALS AND HEAT TREATMENTS

Ferrous and non ferrous metals-cast iron types-steel making process-types of steels-alloys-heat treatment process- annealing-normalising-hardening process-case hardening-hardness testing-impact testing

Module-VII

5 Marks

FORGING

Forge-Refractory materials-forging hand tools- cuttings tools-anvils-forging of steels-forging operations-defects in drawing out-defects in upsetting

Module-VIII

5 Marks

SHEETMETAL WORK

Types of snips-mallet-sheet metal hand tools-compass- stakes-types-uses - metals used in sheet metal work-sheet metal operations-joints-bending machines.

Module-IX

5 Marks

WELDING

General safety-tools and equipments used in gas welding-gases used in welding-types and uses of oxy-acetylene flames- acetylene gas generators-welding nozzles-melting points of common metals-flashback-backfire-gas welding techniques-joints-arc welding machines-welding defects-inspection of welds

Module-X

5 Marks

LATHE

Parts of lathe-specification of lathe-back gear mechanism-work holding devices-cutting tools-tool angles-cutting tool materials-lathe operations-thread cutting-cutting speed-feed-depth of cut-safety in lathe work

PART II : MECHANIC (TRACTOR) (20 Marks)

1. **Clutch**:-types, construction and function. Components of clutch -driver & driven plates, torsion spring, cushion springs, operating fingers, clutch shaft, Slave cylinder & oil seal. Clutch release bearing & linkages.
2. **Manual transmissions** Function, description, types and their application. Gearbox layout. Components of tractor gear box. Principle of epicyclical gear box. Necessity of torque convertor, need of 4 x 4 wheel drive / Front wheel drive, Low & high gear ratio, universal joint and propeller shaft
3. **Final Drive & Drive Shafts** - Differential carriers double reduction gearing, differential lock, crown wheel and pinion adjustments, function and types of power take off (PTO) mechanism. Types of front & rear axles. Common trouble and their remedies and maintenance
4. **REDUCTION GEAR**
Purpose – Functioning
5. **Steering & Suspension Systems** -Function and types of steering system. Description, construction and function of mechanical steering system steering wheel, steering gear box, tie-rod, arms link, ball and socket joints etc. their movement and adjustment. Description and mechanism of foot steering pedal as incorporated in tractors. Description, working and principle of hydraulic steering system. Different parts such as pump, distributor valves, pipe line and hoses etc Development of mechanical framing. Use of Power tiller, Tractor & Bulldozer, Chassis frame from tractor
6. **Braking Systems** - Braking fundamentals Principles of braking, Drum & disc brakes, Lever/mechanical advantage, Hydraulic pressure & force, Brake fade. Braking systems - Brake type used on tractor -principles, Air brakes, Braking system components Park brake system, Brake pedal, Brake lines, Brake fluid, Bleeding, Master cylinder, Divided systems, Tandem master cylinder, Power booster or brake unit, Hydraulic brake booster, Applying brakes, Brake force, Brake light switch Drum brakes & components - Drum brake system, Drum brake operation, Brake linings & shoes, Backing plate, Wheel cylinders Disc brakes & components-Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipers, Proportioning valves, Proportioning valve operation, Brake friction
7. **Description, working principle & use of power tiller**(two wheel tractor) power unit. Method of power transmission to wheel from engine.Main clutch assembling working procedure steering Clutch/brakes mechanism method of power transmission to implement (Rotation), irrigation pump, thresher. Hitching of M.B. Plough, trailer, disc harrow
8. **Tractor equipment**:- Description, function of harrows, cultivators, seed drills & tractor trailer. Hitching of equipment.Danger in overloading & incorrect field operation.Average life of Agriculture implements.Description and function of tractor accessories such as Draw bar, top link

& Belly Pulley.Setting of draw bar to correct height.Use of Hydraulic lift.Maintenance of tractor accessories.

9. **Tractor Electrical Maintenance**: Lighting arrangement in tractors (As applicable).
Description of charging circuit.Operation of alternator, regulator unit ignition warning lamp troubles and remedy in charging system.Fault finding in electrical system.Description of starter motor circuit, common troubles and remedy in starter circuit.Description of lighting circuit. Charging & discharging of lead acid battery.

10. **HITCHING**

Definition of hitching-Purpose-Types Dehitching and Precautions

11. **CULTIVATORS**

Purpose,Types,Constructions of Parts-Prechecks required before operation

13. **CAGE WHEEL** – construction and purpose

15. **ROTAVATOR**

Function and Scope – Construction – Working and Maintenance

16. **ROTARY GRASS MOVER**

Purpose and scope – Construction –Working and Maintenance_____

17. **POWER TILLER** :

Definition of a Tiller – Purpose – Constructional Details – Working Details.

Part-III- Mechanic Motor Vehicle (15 Marks)

MODULE-1- (Chassis and frames) (5 marks)

Classification of vehicles on the basis of load as per central motor vehicle rule, wheels, final drive, and fuel used, axles, position of engine and steering transmission, body and load. Brief description and uses of Vehicle hoists – Two post and four post hoist, Engine hoists, Jacks, Stands. Rear-wheel drive- Propeller shaft, Type of Universal joints, Type of Constant velocity Joints, Rear-wheel final drives, Salisbury axles, Rear-wheel drive

differentials, Limited slip differentials. Four-wheel drive- Four-wheel drive shafts, Four-wheel final drive, Four-wheel. Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such as gearshift position, Seat belt warning light, Parking-brake- engagement warning light and an Engine-malfunction light. Different type of starting and stopping method of Diesel Engines.

I.C Engine Components- Description and Constructional feature of Cylinder head, Importance of head design, Type of Petrol and Diesel combustion chambers, Effect on size of Intake & exhaust passages, Head gaskets. Importance of Turbulence.

Valves & Valve Trains- Description and Function of Engine Valves, different types, materials, Type of valve operating mechanism, Importance of Valve seats, and Valve seats inserts in cylinder heads, importance of Valve rotation, Valve stem oil seals, size of Intake valves, Valve trains, Valve-timing diagram,

MODULE-2 - (Power Transmission system) (5 marks)

Clutch and Gear boxes- **Clutches and Manual Transmissions-**Clutch principles, Single-plate clutches, Multi-plate clutches, Dual mass flywheels, Operating mechanisms **Clutch components-** Pressure plate, Driven- center plate, Throw- out bearing.

Manual transmissions- Gear ratios, Compound gear trains, Gear selection, Bearings, Oil seals & gaskets, Brief about Automated Manual Transmission (AMT). Final Drive & Drive Shafts . Suspension systems.

MODULE-3- (Braking system) (5 marks)

Braking Systems - Principles of braking, Drum & disc brakes, Lever/mechanical advantage, Hydraulic pressure & force, Brake pad, Regenerative braking. Braking systems - Brake type principles, Air brakes,

Exhaust brakes, Electric brakes, Parking brakes, Engine brakes, Regenerative Braking. Braking system components- Park brake system, Brake pedal, Brake lines, Brake fluid, Bleeding, Master cylinder, Divided systems, Tandem master cylinder, Power booster or brake unit, Hydraulic brake booster, Electro hydraulic braking (EHB), Applying brakes, Brake force, Brake light switch Drum brakes & components. Drum brake system, Drum brake operation, Brake linings and shoes, Back plate, Wheel cylinders. Disc brakes and components - Disc brake system, Disc brake operation, Disc brake rotors, Disc brake pads, Disc brake calipers, Proportioning valves, Proportioning valve operation, Brake friction materials.

Suspension Systems- Principles of suspension, Suspension force, Unsprung weight, Wheel unit location, Dampening. Types of suspension- Suspension systems, Solid axle, Dead axle, Description, function and advantages of non independent suspension, Independent suspension, Rear independent suspension, Rear-wheel drive independent suspension

PART IV : MECHANIC (DIESEL) (15 Marks)

Module	Content	Marks
Module 1 : Diesel engine over view	Internal and external combustion engine	3
	Direct and indirect fuel injection system	
Module 2 : Diesel engine components	Description and constructional feature of cylinder head	3
	valve timing	
	Piston and ring	
	Engine assembling special tools	

Module 3 : Cooling & Lubricating system	Cooling and lubricating system	3
	Components of water cooling system	
	Engine lubricating system	
	Lubricant	
Module 4 : Intake and exhaust system	Aircompressor	3
	Exhauster	
	Turbocharger	
	Emission control system	
Module 5 : Diesel fuel system	Fuel feed pump and filter	3
	Fuel injection pump	
	Nozzles	
	Electronic diesel control (EDC) system	
	ECM Electronic control module (or) system	
	Common rail diesel injection CRDI	

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.