MECHANIC TRACTOR

NSQF LEVEL - 4

SECTOR- AUTOMOTIVE

COMPETENCY BASED CURRICULUM

CRAFT INSTRUCTOR TRAINING SCHEME (CITS)

सत्यमेव जयते

GOVERNMENT OF INDIA
Ministry of Skill Development & Entrepreneurship
Directorate General of Training
CENTRAL STAFF TRAINING AND RESEARCH INSTITUTE
EN-81, Sector-V, Salt Lake City, Kolkata – 700091

MECHANIC TRACTOR

(Engineering Trade)

SECTOR – AUTOMOTIVE

(Revised in 2024)

Version 2.1

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Developed By
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1. COURSE OVERVIEW

The Craft Instructor Training Scheme is operational since inception of the Craftsmen Training Scheme. The first Craft Instructors' Training Institute was established in 1948. Subsequently, 6 more institutes namely, Central Training Institute for Instructors (now called as National Skill Training Institute (NSTI)), NSTI at Ludhiana, Kanpur, Howrah, Mumbai, Chennai and Hyderabad were established in 1960's by DGT. Since then the CITS course is successfully running in all the NSTIs across India as well as in DGT affiliated institutes viz. Institutes for Training of Trainers (IToT). This is a competency based course of one year duration. "Mechanic Tractor" CITS trade is applicable for Instructors of "Mechanic Tractor" CTS Trade.

The main objective of Craft Instructor training program is to enable Instructors explore different aspects of the techniques in pedagogy and transferring of hands-on skills so as to develop a pool of skilled manpower for industries, also leading to their career growth & benefiting society at large. Thus promoting a holistic learning experience where trainee acquires specialized knowledge, skills & develops attitude towards learning & contributing in vocational training ecosystem.

This course also enables the instructors to develop instructional skills for mentoring the trainees, engaging all trainees in learning process and managing effective utilization of resources. It emphasizes on the importance of collaborative learning & innovative ways of doing things. All trainees will be able to understand and interpret the course content in right perspective, so that they are engaged in & empowered by their learning experiences and above all, ensure quality delivery.

2. TRAINING SYSTEM

2.1 GENERAL

CITS courses are delivered in National Skill Training Institutes (NSTIs) & DGT affiliated institutes viz., Institutes for Training of Trainers (IToT). For detailed guidelines regarding admission on CITS, instructions issued by DGT from time to time are to be observed. Further complete admission details are made available on NIMI web portal http://www.nimionlineadmission.in. The course is of one-year duration. It consists of Trade Technology (Professional skills and Professional knowledge), Training Methodology and Engineering Technology/ Soft skills. After successful completion of the training programme, the trainees appear in All India Trade Test for Craft Instructor. The successful trainee is awarded NCIC certificate by DGT.

2.2 COURSE STRUCTURE

Table below depicts the distribution of training hours across various course elements during a period of one year:

S No.	Course Element	Notional Training Hours
1.	**Trade Technology**	
	Professional Skill (Trade Practical)	480
	Professional Knowledge (Trade Theory)	270
2.	**Training Methodology**	
	TM Practical	270
	TM Theory	180
	Total	**1200**

Every year 150 hours of mandatory OJT (On the Job Training) at nearby industry, wherever not available then group project is mandatory.

3	On the Job Training (OJT)/ Group Project	150
4	Optional Course	240

Trainees can also opt for optional courses of 240 hours duration.

2.3 PROGRESSION PATHWAYS

- Can join as an Instructor in vocational training Institute/ technical Institute.
- Can join as a supervisor in Industries.

2.4 ASSESSMENT & CERTIFICATION

The CITS trainee will be assessed for his/her Instructional skills, knowledge and attitude towards learning throughout the course span and also at the end of the training program.
a) The Continuous Assessment (Internal) during the period of training will be done by **Formative Assessment Method** to test competency of instructor with respect to assessment criteria set against each learning outcomes. The training institute has to maintain an

individual trainee portfolio in line with assessment guidelines. The marks of internal assessment will be as per the formative assessment template provided on www.bharatskills.gov.in.

b) The **Final Assessment** will be in the form of **Summative Assessment Method**. The All India Trade Test for awarding National Craft Instructor Certificate will be conducted by DGT at the end of the year as per the guidelines of DGT. The learning outcome and assessment criteria will be the basis for setting question papers for final assessment**.** The external examiner during final examination will also check the individual trainee's profile as detailed in assessment guideline before giving marks for practical examination.

2.4.1 PASS CRITERIA

Allotment of Marks among the subjects for Examination:

The minimum pass percent for Trade Practical, TM practical Examinations and Formative assessment is 60% & for all other subjects is 40%. There will be no Grace marks.

2.4.2 ASSESSMENT GUIDELINE

Appropriate arrangements should be made to ensure that there will be no artificial barriers to assessment. The nature of special needs should be taken into account while undertaking the assessment. While assessing, the major factors to be considered are approaches to generate solutions to specific problems by involving standard/non-standard practices.

Due consideration should also be given while assessing for teamwork, avoidance/reduction of scrap/wastage and disposal of scrap/waste as per procedure, behavioral attitude, sensitivity to the environment and regularity in training. The sensitivity towards OSHE and self-learning attitude are to be considered while assessing competency.

Assessment will be evidence based comprising of the following:

- Demonstration of Instructional Skills (Lesson Plan, Demonstration Plan)
- Record book/daily diary
- Assessment Sheet
- Progress chart
- Video Recording
- Attendance and punctuality
- Viva-voce
- Practical work done/Models
- Assignments
- Project work

Evidences and records of internal (Formative) assessments are to be preserved until forthcoming yearly examination for audit and verification by examining body. The following marking pattern to be adopted while assessing:

Performance Level	Evidence
(a) Weightage in the range of 60%-75% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of an ***acceptable standard*** of crafts instructorship with ***occasional* guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***fairly good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A fairly good level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Occasional support in imparting effective training.
(b) Weightage in the range of 75%-90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***reasonable standard*** of crafts instructorship with ***little* guidance** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***good*** skill to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Above average engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A***good*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Little support in imparting effective training.
(c) Weightage in the range of more than 90% to be allotted during assessment	
For performance in this grade, the candidate should be well versed with instructional design, implement learning programme and assess learners which demonstrates attainment of a ***high standard*** of crafts instructorship with ***minimal or no support*** and engage students by demonstrating good attributes of a trainer.	• Demonstration of ***high*** skill level to establish a rapport with audience, presentation in orderly manner and establish as an expert in the field. • Good engagement of students for learning and achievement of goals while undertaking the training on specific topic. • A ***high*** level of competency in expressing each concept in terms the student can relate, draw analogy and summarize the entire lesson. • Minimal or no support in imparting effective training.

3. GENERAL INFORMATION

Name of the Trade	**Mechanic Tractor – CITS**
Trade Code	DGT/ 4027
NCO – 2015	7231.0300, 8341.0101,2356.0100
NOS Covered	ASC/N9412, ASC/N9441, ASC/N9442, ASC/N9443, ASC/N9444, ASC/N9445, ASC/N9446, ASC/N9447, ASC/N9448, ASC/N9449, ASC/N9410, ASC/N9411
NSQF Level	Level - 4
Duration of Craft Instructor Training	One Year
Unit Strength (No. Of Student)	25
Entry Qualification	Degree in Agriculture Engineering/ Automobile/ Mechanical Engineering (with specialization in Automobile) AICTE/UGC from recognized Board / University. OR 03 years Diploma in Agriculture Engineering/ Automobile/ Mechanical Engineering (with specialization in Automobile) after class 10th from AICTE/ recognized Board / University. OR Ex-serviceman from Indian Armed Forces with 15 years of service in related field as per equivalency through DGR. OR 10th Class with 01 year NTC/NAC passed in the trade of "Mechanic Tractor".
Minimum Age	16 years as on first day of academic session.
Space Norms	120 Sq. m
Power Norms	10 KW
Instructor's Qualification for	
1. Mechanic Tractor - CITS Trade	B.Voc/Degree in Agriculture Engineering/ Automobile/ Mechanical Engineering (with specialization in Automobile) from AICTE/UGC recognized Board / University with two years experience. OR 03 years Diploma in Agriculture Engineering/ Automobile/ Mechanical Engineering (with specialization in Automobile) from AICTE/ recognized Board / University with five years experience. OR Ex-serviceman from Indian Armed Forces with 15 years of service in related field as per equivalency through DGR. Candidate should have undergone methods of Instruction of course or minimum 02 years of experience in technical training institute of Indian Armed Forces. OR

	NTC/ NAC passed in the Mechanic Tractor with seven years experience in relevant field. **Essential Qualification**: National Craft Instructor Certificate (NCIC) in **Mechanic Tractor** trade, in any of the variants under DGT.
2. Workshop Calculation & Science	B.Voc/Degree in any Engineering from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in the relevant field. OR NTC/ NAC in any Engineering trade with seven years experience in relevant field. **Essential:** National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA or any of its variants under DGT.
3. Engineering Drawing	B.Voc/Degree in Engineering from AICTE/ UGC recognized Engineering College/ university with two years experience in relevant field. OR 03 years Diploma in Engineering from AICTE /recognized board of technical education or relevant Advanced Diploma (Vocational) from DGT with five years' experience in the relevant field. OR NTC/ NAC in any one of the 'Mechanical group (Gr-I) trades categorized under Engg. Drawing'/ D'man Mechanical / D'man Civil' with seven years experience. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in relevant trade OR NCIC in RoDA / D'man (Mech /civil) or any of its variants under DGT
4. Training Methodology	B.Voc/Degree in any discipline from AICTE/ UGC recognized College/ university with two years experience in training/ teaching field. OR Diploma in any discipline from recognized board / University with five years experience in training/teaching field. OR NTC/ NAC passed in any trade with seven years experience in training/ teaching field. **Essential Qualification:** National Craft Instructor Certificate (NCIC) in any of the variants under

	DGT / B.Ed /ToT from NITTTR or equivalent.
5. Minimum Age for Instructor	21 Years

4. JOB ROLE

Brief description of job roles:

Manual Training Teacher/Craft Instructor; instructs students in ITIs/Vocational Training Institutes in respective trades as per defined job role. Imparts theoretical instructions for the use of tools& equipments of related trades and related subjects. Demonstrate process and operations related to the trade in the workshop; supervises, assesses and evaluates students in their practical work. Ensures availability & proper functioning of equipment and tools in stores.

Tractor Mechanic; repairs and overhauls tractors by various mechanical processes for agriculture, constructional and other heavy duties. Examines and drives vehicle on road or runs engine in stationary position to diagnose troubles and defects. Dismantles part or complete engine or unit according to nature of defects. Repairs or replaces defective parts, reassembles them with prescribed settings, clearances, timings and adjustments by further tooling as necessary and ensures accuracy of fit. Installs assembled or repaired engine securely in position on vehicle chassis and connects oil and fuel lines, controls and other accessories. Starts engine and observes performance for any unusual noise and knocks. Adjusts carburetor, fuel pump (Carburetor for petrol engine and fuel pump for diesel engine), sets clearance between tappets and valves, tunes engine, adjusts brakes, makes electrical connections and performs other tasks to ensure stipulated performance. May repair and overhaul electric motors, fuel pump, carburetor etc. of engine. May weld braze or solder parts. may repair other agricultural machinery for ploughing, levelling, harvesting etc. and be designated as mechanic, agricultural machines.

Tractor Operator, Farm; operates and services farm tractor having different attachments for ploughing, harrowing, harvesting and other agricultural operations. Checks different parts of tractor to ensure that it is in proper working order. Collects, attaches and adjusts special equipment, required for different operations of tractor. Feeds tractor with fuel and demarcates land for ploughing. Starts tractor and drives it through fields at regulated speed depending on nature of soil and work. Controls operation of different attachments including turning of wheels by operating levers and pedals as required. Tows trailers laden with crops and other materials when required. Cleans and oils machine. Maintains tractor and other implements in good working order and keeps record of fuel consumption. May supervise work of Helpers. May detect mechanical defects and undertake minor repairs.

Reference NCO 2015:

a) 2356.0100-Manual Training Teacher/Craft Instructor.
b) 7231.0300-Tractor Mechanic
c) 8341.0101 - Tractor Operator, Farm

Reference NOS:

a) ASC/N9412
b) ASC/N9441
c) ASC/N9442
d) ASC/N9443
e) ASC/N9444
f) ASC/N9445
g) ASC/N9446
h) ASC/N9447
i) ASC/N9448
j) ASC/N9449
k) ASC/N9410
l) ASC/N9411

5. LEARNING OUTCOME

Learning outcomes are a reflection of total competencies of a trainee and assessment will be carried out as per the assessment criteria.

5.1 TRADE TECHNOLOGY

1. Analyse & implement the quality management techniques, comply safe working practices in workplace while handling of Hand tools, special tool and maintenance of garage equipment; also able to manage database application. (NOS: ASC/N9412)
2. Identify Tractor engine components, apply principles of IC engines, thermodynamic cycles, valve timing of engine and carryout overhauling of the Tractor Engine Components. (NOS: ASC/N9441)
3. Troubleshoot fuel feed system of Petrol/Diesel engines and execute maintenance, diagnosis & servicing of Lubrication/Cooling system of tractor engine. (NOS: ASC/N9442)
4. Diagnose, Service and Maintain Electrical System viz. Battery, Starting system, Charging System and Ignition system. (NOS: ASC/N9443)
5. Plan & execute servicing & maintenance of Emission Control System & monitor the conduction of Emission Control Test. (NOS: ASC/N9444)
6. Assess Engine Performance tests, lighting system tests, using various tools; diagnose & troubleshoot them. (NOS: ASC/N9445)
7. Plan & execute servicing and testing of different fuel injection pumps, manage independently overhauling of injectors. (NOS: ASC/N9446)
8. Diagnose and perform overhauling of Tractor Transmission System and check Tractor Wheels and tubes for replacement. (NOS: ASC/N9447)
9. Plan & schedule overhauling of different types of Steering system/ brake system and maintenance of Tractor & Air Conditioning of Tractor. (NOS: ASC/N9448)
10. Drive Tractor on field, schedule maintenance operation of tractor and execute Hitching and unhitching of Agricultural Implements. (NOS: ASC/N9449)
11. Read and apply engineering drawing for different application in the field of work. (NOS: ASC/N9410)
12. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS: ASC/N9411)

6. COURSE CONTENT

SYLLABUS FOR MECHANIC TRACTOR – CITS TRADE			
TRADE TECHNOLOGY			
Duration	**Reference Learning Outcome**	**Professional Skills (Trade Practical)**	**Professional Knowledge (Trade Theory)**
Practical 20 Hrs. Theory 10 Hrs.	Analyze & implement the quality management techniques, comply safe working practices in workplacewhile handling of Hand tools, special tool and maintenance of garage equipment; also able to manage database application.	1. Practice 5s techniques in the automobile workshop. 2. Practice 7QC techniques in the automobile workshop. 3. Precautions to be observed while working in the automobile workshop and garage equipment. 4. Familiarization with computer, Practice on data base creation with MS access and data base application.	• Admission, introduction, facility available in the institute. • Importance of safety, safety precautions& first aid. • Concept of 5S & 7QC tools, time management as employed for quality circle. • Importance of healthy environment. • Application of computers & its Features. Physical & logical concept of data base.
		5. Handling & maintenance of hand tools, special tools, equipment & machineries. 6. Maintenance of garage equipment in the workshop. 7. Preventive maintenance of vehicle/engine.	• Application and safety to be observed while handling hand tools, special tools, equipment & machineries. • Importance and types of maintenance of vehicles/engines.
Practical 75 Hrs. Theory 30 Hrs.	Identify Tractor engine components, apply principles of IC engines, thermodynamic cycles, valve timing of engine and carryout overhauling of the Tractor Engine Components.	8. Checking engine vacuum &compression pressure. 9. Taking Cylinder leakage test with compressed air. 10. Measure the cubic capacity of a given engine.	• Explanation of Principle of All types of SI and CI Engines with respect to pressure, volume and temperature. • Thermodynamic cycles with respect to pv&ts diagrams. Valve timing diagram of all types of

			Engine
		11. Servicing cylinder head assembly Remove all accessories attached with the engine dismantling the head components and its visual inspection. 12. Measuring components for wear with precision measuring instruments- suggestions for remedy and taking remedial measures. 13. Reassembling cylinder head components.	• Importance of servicing cylinder head Precautions to be observed while servicing cylinder head. • Reasons for frequently occurring abnormal wear in cylinder head components and its Effects on engine performance. • Constructional details, Advantages and disadvantages of variable valve timing.
		14. Servicing cylinder block assembly Removing and dismantling piston and connecting rod assembly, crank shaft and flywheel, vibration damper from the engine. 15. Visual inspection of cylinder block for various parameters such as bore, main journal etc. for wear and suggest remedial measures. 16. Visual inspection of the cylinder blocks components (piston and connecting rod assembly, crank shaft, flywheel etc.)	• Importance of servicing cylinder block- Precautions to be observed while servicing cylinder block. • Reason for measuring cylinder block for various parameters to find out its serviceability and suggestions for remedial measures. Reasons for frequently occurring abnormal wear in cylinder block components and its Effects on engine performance.
		17. Measuring cylinder block & components for wear with precision measuring instruments suggestions for remedy and taking remedial measures. 18. Reassembling the engine block and its components. 19. Refit cylinder head assembly. Setting valve timing. 20. Checking and setting valve clearance.	• Importance of measuring cylinder blocks components for actual wear to decide serviceability. • Engine assembly procedure as recommended by manufacturers. Importance and correct procedure of setting valve timing • Importance of correct

		21. Practice on checking and setting variable valve timing.	valve clearance • Precautions to be observed while assembling engine components
		22. Maintenance, diagnosis and Servicing intake systems Servicing of different types of air cleaner, turbocharger, intercooler, throttle body, intake manifold. 23. Maintenance, diagnosis and Servicing exhaust systems Servicing of exhaust manifold, catalytic converter, resonator, muffler.	• Study about intake system components such as air cleaner, different types of turbo charger, super charger, throttle body, intake manifold etc. Importance of maintenance, diagnosis and Servicing intake systems. Causes of failure of the components of intake system. Trouble shooting in an intake system. • Study about exhaust system components such as exhaust manifold, muffler, types of catalytic converter etc. Importance of maintenance, diagnosis and Servicing exhaust systems. Causes of failure of the components of exhaust system. Trouble shooting in an intake system.
Practical 75 Hrs. Theory 30 Hrs.	Troubleshoot fuel feed system of Petrol/Diesel engines and execute maintenance, diagnosis & servicing of Lubrication/Cooling system of tractor engine.	24. Maintenance, diagnosis and servicing of basic petrol fuel system components. 25. Overhauling of fuel tank, mechanical fuel Pump, electrical pump, fuel filters, carburettors. 26. Testing of fuel pumps for proper functioning.	**FUEL SUPPLY SYSTEM IN PETROL ENGINE Gasoline Fuel**: • Properties of Gasoline fuel – combustion processes Study about carburetor fuel system and its components such as fuel tank, mechanical fuel Pump,

			electrical pump, fuel filters, carburetors and its circuits etc. Importance of maintenance, diagnosis and Servicing carburetor fuel system and its components. Causes of failure of the carburetor fuel system and its components. Trouble shooting in carburetor fuel system and its components. Importance of testing of fuel pumps
		27. Maintenance, diagnosis and servicing of conventional diesel fuel system and its components. 28. Overhauling of fuel tank, fuel feed Pump, electrical pump, fuel filters, types of fuel injection pumps, governors, injector. 29. Testing of fuel feed pumps for proper functioning. 30. Servicing of fuel tanks, checking leaks in the fuel lines, draining of water separators. 31. Replacing of primary& secondary filters. 32. Phasing and calibration of fuel injection pump. Testing of injectors for its proper functioning. Setting fuel injection timing Bleeding diesel fuel system.	**FUEL SUPPLY SYSTEM IN DIESEL ENGINES Diesel fuel &its properties** – combustion processes • Study about conventional diesel fuel system and its components such as fuel tank, fuel feed Pump, electrical pump, fuel filters, water separators, fuel injection pumps, governors, injectors etc. • Importance of maintenance, diagnosis and Servicing diesel fuel system and its components. Causes of failure of the diesel fuel system and its components. • Importance of testing of fuel feed pumps, FIP and injectors. Importance of setting correct FIP timing. Importance of bleeding the fuel system. • Trouble shooting in diesel fuel system and

			its components.
		33. Maintenance, diagnosis and servicing of lubrication system. 34. Changing engine oil and filter. 35. Tracing oil leak from the engine. 36. Overhauling of oil pump. 37. Checking oil pressure relief valves for proper functioning. 38. Servicing oil coolers. 39. Checking oil galleries Oil pressure testing. 40. Removing of sludge by using flushing oil.	• Engine Lubrication System Lubricant, types, application and its properties. Study about lubrication systems and its components such as oil sump, oil strainer, oil pump, relief valve, filter, bypass valve, oil cooler etc. Study about oil filtering systems. Importance of maintenance, diagnosis and Servicing lubricating system and its components. Causes of failure of the lubricating system and its components. • Importance of testing of oil pumps. Importance of servicing oil filter. Importance of checking and setting correct oil pressure. Reasons for sludge formation and its prevention • Trouble shooting in lubricating system and its components
		41. Maintenance, diagnosis and servicing of cooling system Flushing cooling system replacing coolant. 42. Tracing coolant leakage from the engine. 43. Checking cooling system for proper functioning. Replacing/Overhauling of water pump. 44. Checking thermostat valve. 45. Adjusting fan belt tension. 46. Checking radiator pressure cap for proper functioning. 47. Replacing/Servicing radiator. Diagnosis of improper operating temperature.	• **Engine Cooling System** Coolant, types, and its properties. Importance of maintaining correct coolant-water ratio. • Study about cooling systems and its components such as radiator, pressure cap, types of hoses, types of water pump, electric fan, thermostat, fan belts, temperature gauge, temperature sensor etc. • Study about oil filtering

			systems. Importance of maintenance, diagnosis and Servicing cooling system and its components. • Causes of failure of the cooling system and its components. • Importance of testing of pressure cap. Importance of servicing radiator. Trouble shooting in cooling system and its components.
Practical 45 Hrs. Theory 15 Hrs.	Diagnose, Service and Maintain Electrical System viz. Battery, Starting system, Charging System and Ignition system.	48. Maintenance, diagnosis and servicing battery checking of battery condition using hydrometer and battery tester. 49. Charging batteries in series and parallel. 50. Maintenance of battery. Jump starting a battery. 51. Preparation of electrolyte. 52. Reconditioning of terminal post.	• Maintenance, diagnosis and servicing battery Checking of battery condition using hydrometer and battery tester. • Charging batteries in series and parallel. Maintenance of battery. Jump starting a battery. • Preparation of electrolyte. Reconditioning of terminal post. • Battery/accumulator: - types, construction, working. Battery capacity &rating, Booster starting. IBS, Disposal of waste battery. Advantages of slow charging. Advantages of solidification of electrolyte by adding salicylic acid or introducing absorbed glass mat (AGM) – VRLA batteries Electrolyte-definition, percentage of sulphuric acid and water.

			• Effects of improper ratio of acid and water on battery life. • Specific gravity of water, acid and electrolyte. Temperature effect on specific gravity. Battery troubles and their remedies
		53. Maintenance, diagnosis and servicing of starting system. 54. Checking starter circuit for proper functioning. 55. Checking solenoid switches for proper functioning. 56. Overhauling all types of starter. 57. Checking of starter for proper functioning.	• Study about starting system and its components. Importance of checking starter circuit for proper functioning. • Role of solenoid switch and relay, importance of its checking. • Importance of testing starter components. Troubles and remedies in starting system
		58. Maintenance, diagnosis and servicing of charging system. 59. Checking charging circuit voltage drop test for proper functioning. 60. On vehicle inspection of alternator for proper functioning. 61. Overhauling of alternator Testing voltage regulator. 62. Maintenance, diagnosis and servicing of conventional ignition system. 63. Checking ignition circuit for proper functioning. 64. Checking magneto coil for proper functioning. 65. Checking magneto for proper strength. 66. Checking and Setting of magneto ignition timing using Ignition Timing light.	• Study about Charging system and its components Importance of checking charging circuit for proper functioning. Importance of voltage regulation. • Importance of testing charging system components. Troubles and remedies in charging system • Study about types of conventional Ignition system and its components. Importance of checking ignition circuit. Importance of checking and setting correct ignition timing.

		67. Overhauling distributor. 68. Checking vacuum & centrifugal advance mechanism for proper functioning. 69. Testing ignition coil, spark plug, condenser for proper functioning using testing equipment. 70. Setting ignition timing. 71. Checking of Ignition timing using Ignition Timing light.	• Study about distributor and its components. Importance of checking distributor for proper functioning. • Importance of testing ignition coil, spark plug, condenser for proper functioning. Common troubles in Ignition system.
Practical 09 Hrs. Theory 06 Hrs.	Plan & execute servicing &maintenance of Emission Control System & monitor the conduction of Emission Control Test.	72. Checking of exhaust gas in petrol engine using exhaust gas analyser. 73. Checking of exhaust gas in diesel engine using Smoke meter. 74. Maintenance of crank case ventilation system. 75. Maintenance of EGR system.	**EMISSION CONTROL SYSTEM.** • Definition, Sources of emission (such as Exhaust system, crank case, fuel tank and carburetor). • Methods to control emission, (1. exhaust system with EGR OR Air injection system in to exhaust manifold with catalytic converter 2. Positive crank case ventilation. 3. Evaporative control system ie charcoal canister.) • Vehicle emission standards- Euro and Bharat standards. Emission control.
Practical 40 Hrs. Theory 20 Hrs.	Assess Engine Performance tests, lighting system tests, using various tools; diagnose & troubleshoot them.	76. Trouble tracing in lighting system, Head light alignment. 77. Trouble tracing in digital dashboard gauges. Horn circuit. 78. Servicing of horn. Servicing of wiper motor.	• Lighting system and accessories: - Function, lay out, working of all circuits. Emergency light, Head lights, Indicator & Side light, Brake Light, Dashboard lights, Rear Servicing lights, Light circuit and switches. • Dashboard gauges Horn and horn relay circuit, Wiper motor

			and its circuit, Flasher unit and its circuits.
		79. Determining the mechanical efficiency of the engine by Morse test using dynamometer and tachometer. 80. Determining air consumption, lubricating oil consumption.	**ENGINE PERFORMANCE TESTS** • Purpose of testing an I.C engine. Classification of tests, fault finding tests, Routine tests. Measurement of Horse power & torque, Indicated mean effective pressure. Mechanical efficiency, Fuel consumption, Thermal efficiency, Volumetric efficiency, Power take off test. Air Consumption, Lubricating oil consumption. • Dynamometers and its types. Preparation of heat balance sheet.
		81. Trouble tracing in engine using multi scan tool such as Engine management system, electronic fuel injection, Air flow measurement, Variable intake manifold system, types of EFI wiring system, Electronic control unit, malfunction indicating lamp, Data link connector, Onboard diagnostic system. 82. Checking of sensors. Checking of actuators. 83. Checking of pumps.	ENGINE MANAGEMENT SYSTEM. • Definition, Function, Types of system available. • Parts of Engine Management System.(All sensors, actuators, pumps.) & their function. • Closed and open loop system, cold start system, Air flow measurement, Variable intake manifold system, EFI wiring system, Electronic control unit, pre heaters for inlet manifold, Data link connector, Onboard diagnostic system.

		84. Trouble shooting for DTC (Diagnostic Trouble Code)-checking DTC circuits. 85. Identifying the trouble by scan tool-tracing the faults by trouble code-checking intermittent problems-final confirmation test.	• Details of trouble codes-functions of sensors and actuators-details of scan tool-precautions while working with sensors and actuators.
Practical 51 Hrs. Theory 09 Hrs.	Plan & execute servicing and testing of different fuel injection pumps, manage independently overhauling of injectors.	86. Maintaining fuel injection test bench. 87. Practice on overhauling &testing of different types inline fuel injection pump. 88. Servicing and testing different types of distributor type fuel injection pumps.	• Importance of testing the pumps. Procedure for testing before dismantling. • Procedure as per the manufacturer for dismantling, inspecting and assembling inline pump. • Detailed description of procedure of servicing mechanically controlled distributor type and solenoid valve controlled distributor type pumps details of start assist systems.
		89. Servicing CRDI fuel system. checking low pressure fuel supply circuit-preliminary check. 90. Checking fuel pump operation. 91. Checking fuel pressure-checking high pressure fuel supply circuit-checking fuel injector leak-checking fuel regulator.	• Precautions to be observed before removing the CRDI fuel system-study about the low and high pressure fuel supply circuit.
		92. Removing a CRDI pump from an engine refit the pump to the engine. 93. Start and adjust slow speed of the engine. 94. Overhauling of various types of injectors. 95. Testing of various types of injector. 96. Checking and replacing the components of CRDI system.	• Electronic Diesel control- Electronic Diesel control systems, Common Rail Diesel Injection (CRDI) system, Hydraulically actuated electronically controlled unit injector (HEUI) diesel injection system. Sensors, actuators and ECU (Electronic Control

			Unit) used in Diesel Engines.
Practical 55 Hrs. Theory 20 Hrs.	Diagnose and perform overhauling of Tractor Transmission System and check Tractor Wheels and tubes for replacement.	97. Diagnosis of clutch Assy. Overhauling of Clutch Assy. 98. Adjusting clutch master slave cylinder/ paddle play. Testing for correct functioning.	**Transmission system, Clutch:** • Description and function of different types of clutches such as dog, frictional (dry & wet). Functional parts of frictional clutch such as flywheel, clutch plate, pressure plate, clutch release bearing, paddle & linkages. • Advantages & working of dual plate clutch. Methods of fixing of clutch lining & material used for lining. • Different types of clutch actuating mechanism. Common troubles & remedies. Care & maintenance.
		99. Dismantling gearbox. 100. Overhauling of Gearbox assembly. 101. Testing for correct functioning.	• Gear box : Types of gear box. Description and function of gear box used in tractors. Layout of four speed gear box. • Constructional details of gear box. • Use of synchromesh unit. Use of starting safety switch. Comparison between transmission system of a motor-vehicle and tractor. Common troubles and their remedies. Properties & grade of oil used in gear box. Care & maintenance
		102. Overhauling, differential, final drive etc. 103. Checking, repairing and	• Joints:- Function & working PTO. Types of PTO drives. (propeller

		replacing parts. Checking & adjusting backlash. Setting of differential lock/ PTO shaft. Checking oil leakage. Field operation of PTO shaft/ belt pulley with different agricultural machinery.	shaft & Belt Pulley system) Function & working of differential lock. Use of slip joint & universal joint. Adjustments such as backlash, preloading. Common troubles and their remedies. Differential & final drive: Function of differential & final drive of tractors. Description and function of unit assemblies such as, differential, axle and final drive, wheel hub etc
		104. Servicing & adjustments of distributor. 105. Checking/ Inspection of Hydraulic connections. Hydraulic jacks-couplings. Field operation of different agricultural machinery with three point linkages system & with auxiliary hydraulic system.	• Hydraulic system: Use of hydraulics, Different types of hydraulics and its mechanism. Function & Working of different parts such as hydraulic pump, distributor and operating valves & rams, hose pipe. Function & working of auxiliary hydraulic system. Description of hydraulic jack. Adjustments and maintenance procedure.
		106. Removing Wheels from tractor, checking tyres for wear and tubes for leaks. 107. Practice on refitting tyres and tubes and wheels and inflating to correct pressure. 108. Fitting wheels on tractors tightening wheel holding nuts in correct sequence. 109. Safety precautions related to practical.	• Classification of Tractors Wheels & Tyres Description of various types of tractors in general. Chassis frame of tractor-constructional details, Reinforcement of engine mountings on chassis. Wheels tyres and tubes-solid and pneumatic tyres

			various types and sizes, tread description and use. Fitting of tyres and tubes, importance of inflatting tyres to correct pressure. Repair and maintenance of tyres and tubes. Balancing of Tractor wheels, importance of tyre blasting.
Practical 75 Hrs. Theory 30 Hrs.	Plan & schedule overhauling of different types of Steering system/ brake system and maintenance of Tractor & Air Conditioning of Tractor.	110. Layout of steering system of Mechanical steering System. 111. Checking/Inspection of Steering linkage and necessary repair. 112. Removal of steering wheel, steering gear box from tractor for overhauling. 113. Removal front axle and spindle hub and steering linkage. 114. Reassembling steering assembly and Test for correct function including steering geometry. 115. Wheel track setting front and rear Ground clearance.	• Steering System(Mechanical) : Steering description, construction and function of steering gear unit including wheel, rod worm, quadrant arm link, tie rod, ball and socket joints etc. their movement and adjustment. Description and mechanism of foot steerage pedal as incorporated in tractors. Importance of steering geometry (toe in, toe-out, camber/caster, king pin inclination). Description of Wheel base, Wheel track and ground clearance.
		116. Layout of steering system of Hydraulic steering System.Dismantling, Checking / Inspection of Hydraulic pump, steering distributor & connections. 117. Reassembling steering assembly and Test for correct function.	• Steering System(Hydraulic): • Description and working principle of the hydraulic steering system of tractors. Function & Working of different parts such as hydraulic pump, distributor and operating valves & rams, hose pipe etc.

			Adjustments of the hydraulic steering system of tractors. Faults & remedies. Care & maintenance.
		118. Overhauling of mechanical (shoe/ disc) brakes. 119. Practice of relining of brake shoes. Inspecting and setting parking brakes. Adjusting brake paddle play.	• Brakes: Different types of brakes used in tractors. Description, working principle of mechanical brakes, such as shoes type, disc type brakes (dry & wet). Mechanism & function of disc type brakes. Mechanical hand brake for parking, and its fitting. Adjustment of brakes. Faults finding & remedies. Care & maintenance
		120. Diagnosis of brake system. 121. Removing, Dismantling master cylinder & wheel cylinder. 122. Inspecting master cylinder, wheel cylinder piston and valves. 123. Replacement of washer and oil seals. 124. Reassembling of hydraulic brakes. 125. Bleeding and adjustment of hydraulic brakes. 126. Field testing of hydraulic brakes.	• Hydraulic brake: Properties & selection of brake fluid. • Description, working principle of hydraulic brakes used in tractors. Types of master cylinder. Function & working of master cylinder & wheel cylinder. Bleeding and adjustment of hydraulic brakes. • Brake testing, efficiency of brakes, braking distance & weight transfer during braking. Common troubles & remedies. Care & maintenance. Precautions related to the brakes.
		127. Servicing & maintenance of Air Conditioning System and gas charging / recycling.	• Air Conditioning System: Necessity of air Conditioning System in tractors/

			combine harvesters/Dozers. Working of AC. Study of different components of system such as compressor, condenser, evaporator, thermostat valve. Study of refrigerant/ gas used in Air Conditioning System
Practical 35 Hrs. Theory 10 Hrs.	Drive Tractor on field, schedule maintenance operation of tractor and execute Hitching and unhitching of Agricultural Implements.	128. Practice on scheduled maintenance after 10, 50, 100, 250, 500, 1000 hours of operation of tractor.	• Introduction to Tractor maintenance, Trouble shooting. Precautions & Safety measures for handling Maintenance tools. Routine check up and maintenance of tractor not in use.
		129. Exercise in driving a tractor. 130. Trouble shooting in tractor driving and testing the performance of a tractor. Tractor driving with different implements.	• Tractor driving: Description and function of tractor accessories such as Draw bar, top link & Belt Pulley. Importance & setting of draw bar & top link to correct height. Use of Draw bar, top link & Belt Pulley during operation. Motor Vehicle Act, Driving Rules.
		131. Hitching & unhitching of Agricultural implements. 132. Field operation of agriculture implements and adjustment for correct functioning.	• Field operation: Tractor operated equipment. Brief description and function of ploughs, cultivator, harrows, seed drill of different types etc. Fitting, fixing and Adjusting of equipment, Danger in overloading and incorrect hitching/ operation of ploughs. Average of life of agriculture implements.

			Common troubles and their remedies.
Engineering Drawing: 45 Hrs.			
Professional Knowledge ED- 45 Hrs.	Read and apply engineering drawing for different application in the field of work.	**CIRCLES, TANGENTS AND ELLIPSE:** Practical applications procedure for constructing tangent to given circle-lines- loop pattern-- tangential circles- external tangents- internal tangents ellipse **PARABOLIC CURVES, HYPERBOLA:** Involutes - Properties and their application. Procedure for constructing parabolic curve-hyperbolic curve-in volute curve. epicycloids, hypocycloid, Involutes, spiral & Archimedes spiral **TECHNICAL DRAWING/ SKETCHING OF COMPONENTS' PARTS:** Views of object Importance of technical sketching-types of sketches-Isometric drawing sketching- Oblique drawing sketching. **PROJECTIONS**: Theory of projections (Elaborate theoretical instructions), Reference planes, orthographic projections concept 1st Angle and 3rd Angle, Projections of points, Projections of Lines–determination of true lengths & inclinations. Projections of plane, determination of true shape. Exercises on missing surfaces and views. Orthographic drawing or interpretation of views. Introduction to first angle projections of solids. **ISOMETRIC VIEWS**: Fundamentals of isometric projections (Theoretical Projections) Isometric views from 2 to 3 given orthographic views. Preparation of simple working drawing of Furniture items like table, stool and any job prepared in the workshop. **SECTIONAL VIEWS:** Importance and salient features, Methods of representing sections, conventional sections of various materials, classification of sections, conventional in sectioning. Drawing of full section, half section, partial or broken out sections, offset sections, revolved sections and removed sections. Drawing of different conventions for materials in section, conventional breaks for shafts, pipes, Rectangular, square angle, channel, rolled sections. Exercises on sectional views of different objects. - **DEVELOPMENT AND INTERSECTIONS:** Development of surfaces-Types of surface- Methods of development-Intersection- Methods of drawing intersection lines-critical point or key point. **FASTENERS**: Sketches of elements of screw threads, Sketches

		of studs, cap screws machine screws, set screws, Locking devices, bolts, Hexagonal & square nuts & nut bolt & washer assembly. Sketches of plain spring lock, toothed lock, washers, cap nut, check nut, slotted nut, cassel nut, sawn nut, wing nut, eye blot, tee bolt & foundation bolt. Sketches of various types of rivet heads (snap–pan–conical– countersunk) Sketches of keys (sunk, flat, saddle, gib head, woodruff) Sketches of hole & shaft assembly. **DETAIL DRAWING AND ASSEMBLY DRAWING:** Details of machine drawing- Assembly drawing- surface quality-surface finish standard- Method of indicating surface roughness for general engineering drawing-symbols used for indication of surface roughness-symbols for direction of lay. Geometrical tolerance. Detail drawing of the following with complete dimensioning, tolerances, material and Surface finish specifications 1. Universal couplings 2. Ball bearing and roller bearing. 3. Fast and loose pulley. 4. Stepped and V belt pulley. 5. Flanged Pipe joints, right angle bend. 6. Tool Post of Lathe Machine. 7. Tail Stock of Lathe Machine 8. Stepped and V belt pulley. 9. Flanged Pipe joints, right angle bend. 10. Tool Post of Lathe Machine. 11. Tail Stock of Lathe Machine Practice of blue print reading on limit, size, fits, tolerance, machining symbols, and reading out of assembly drawing etc., ISO Standards. **READING OF ENGINEERING DRAWING:** Blue print and machine drawing reading exercises. **GRAPHS & CHARTS**: Types (Bar, Pie, Percentage bar, Logarithmic), Preparation & interpretation of the graphs and charts. **AUTO CAD:** Familiarization with AutoCAD application in engineering drawing. Practice on AutoCAD using Draw & Modify commands. Practice on AutoCAD with Rectangular snap using Draw, Modify, Inquiry commands. Practice on AutoCAD using text dimensioning& dimensioning styles

		Practice on AutoCAD to draw nuts, bolts & washers. Isometric views-isometric views with square, taper and radial surface-simple & complex views. Perspective views. Practice on AutoCAD using isometric snap to make isometric drawings Practice on AutoCAD using Hatch command and application. Practice on AutoCAD using 3D primitives with UCS (User Co-ordinate system).
WORKSHOP CALCULATION & SCIENCE: 45 Hrs.		
Professional Knowledge WCS- 45 Hrs.	Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study.	**WORKSHOP CALCULATION:** **Fraction:** Concept of Fraction, Numbers, Variable, Constant, **Ratio & Proportion**: - Trade related problems **Percentage:** Definition, changing percentage to decimal and fraction and vice versa. Applied problems related to trade. Estimation and cost of product. **Algebra:** Fundamental Algebraic formulae for multiplication and factorization. Algebraic equations, simple & simultaneous equations, quadratic equations and their applications. **Mensuration 2D:** Concept on basic geometrical definitions, basic geometrical theorems. Determination of areas, perimeters of triangles, quadrilaterals, polygons, circle, sector etc. **Mensuration 3D:** Determination of volumes, surface areas of cube, cuboids cylinders, hollow cylinder, sphere prisms, pyramids cone spheres, frustums etc. Mass, Weight, Volume, Density, Viscosity, Specific gravity and related problems. **Trigonometry:** Concept of angles, measurement of angles in degrees, grades and radians and their conversions. Trigonometrical ratios and their relations. Review of ratios of some standard angles (0, 30,45,60,90 degrees), Height & Distances, Simple problems. **Graphs:** basic concept, importance. Plotting of graphs of simple linear equation. Related problems on ohm's law, series-parallel combination. **Statistics:** Frequency tables, normal distribution, measure of central tendency – Mean, Median & Mode. Concept of probability. Charts like pie chart, bar chart, line diagram, Histogram and frequency polygon. **WORKSHOP SCIENCE:** **Units and Dimensions:** Conversions between British & Metric system of Units. Fundamental and derived units in SI System, Dimensions of Physical Quantities (MLT)-Fundamental &

		Derived. **Engineering Materials:** Classification properties and uses of ferrous metals, non-ferrous metals, alloys etc. Properties and uses of non-metals such as wood, plastic, rubber, ceramics industrial adhesives. **Heat & Temperature:** Concepts, differences, effects of heat, different units, relation, specific heat, thermal capacity, latent heat, water equivalent, mechanical equivalent of heat. Different Temperature measuring scales and their relation. Transference of heat, conduction, convection and radiation. Thermal Expansion related calculations. **Force and Motion**: Newton's laws of motion, displacement, velocity, acceleration, retardation, rest & motion such as linear, angular. Force – units, different laws for composition and resolution of forces. Concept on centre of gravity and equilibrium of forces in plane. Concept of moment of inertia and torque. **Work, power & energy**: Definitions, units, calculation & application. Concept of HP, IHP, BHP and FHP – related calculations with mechanical efficiency. S.I. unit of power and their relations. **Friction:** Concept of friction, laws of friction, limiting friction, coefficient of friction and angle of friction. Rolling friction & sliding friction with examples. Friction on inclined surfaces **Stress & Strain:** Concepts of stress, strain, modulus of elasticity. Stress- strain curve. Hook's law, different module of elasticity like Young's modulus, modulus of rigidity, bulk modulus and their relations. Poisson's ratio. **Simple machines:** Concept of Mechanical Advantage, Velocity Ratio, Efficiency and their relations. Working principles of inclined plane, lever, screw jack, wheel and axle, differential wheel and axle, worm and worm wheel, rack and pinion. Gear train. **Electricity:** Basic definitions like emf, current, resistance, potential difference, etc. Uses of electricity. Difference between ac and dc. Safety devices. Difference between conductors and semiconductors and resistors, Materials used for conductors, semiconductors and resistors. Ohm's Law. Series, parallel and series-parallel combination of resistances. Concept, definitions and units of electrical work, power and

		energy with related problems. **Fluid Mechanics:** Properties of fluid (density, viscosity, specific weight, specific volume, specific gravity) with their units. Concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum and differential pressure.

SYLLABUS FOR CORE SKILLS
1. Training Methodology (Common for all trades) (270Hrs + 180Hrs)

Learning outcomes, assessment criteria, syllabus and Tool List of Core Skills subjects which is common for all the CITS trades, provided separately in www.bharatskills.gov.in. / dgt.gov.in

7. ASSESSMENT CRITERIA

LEARNING OUTCOME	ASSESSMENT CRITERIA
TRADE TECHNOLOGY (TT)	
1. Analyze & implement the quality management techniques, comply safe working practices in workplace while handling of Hand tools, special tool and maintenance of garage equipment; also able to manage database application. (NOS:ASC/N9412)	Review 5S techniques in the automobile work shop.
	Implement & monitor 7QC techniques in the automobile work shop.
	Maintain proper procedure of handling tools
	Apply necessary precautions while using special tools.
	Monitor garage maintenance procedures for maintaining garage equipment.
	Classify the garage equipment and store it as per laid down procedures for safety usage.
	Operate computer, and demonstrate data base creation with MS access and data base application.
	Demonstrate preventive maintenance of vehicle/engine.
2. Identify Tractor engine components, apply principles of IC engines, thermodynamic cycles, valve timing of engine and carryout overhauling of the Tractor Engine Components. (NOS:ASC/N9441)	Conduct Cylinder leakage test with compressed air and analyze the same.
	Measure the cubic capacity of an given engine
	Recognize the different engine components
	Monitor & evaluate measurement of the Engine components.
	Test engine Vacuum & compression pressure.
	Follow safety compliance during dismantling and assembling of engine components.
	Maintain the standard procedure for dismantling and assembling of engine components.
	Plan & execute servicing cylinder head assembly/block assembly.
	Conduct Visual Inspection of Cylinder Head/ Block and it's components using various parameters like bore/ main journal etc. for wear and suggest remedial measures.
	Measure components for wear with precision measuring instruments-Suggest for remedy and take remedial measures.
	Ensure Valve clearance and variable valve timing.
	Examine Intake and Exhaust system of engine.
3. Troubleshoot fuel feed system of Petrol/Diesel engines and execute maintenance, diagnosis & servicing of Lubrication/Cooling system of tractor engine. (NOS:ASC/N9442)	Conduct Fuel pump/ Fuel feed pumps/ testing for proper functioning.
	Examine servicing of Fuel feed system.
	Perform & review phasing and calibration of Fuel injection pump.
	Ensure proper flow of fuel in fuel feed system.
	Conduct Injector testing/ Oil pressure testing /
	Monitor replacement of filter /engine oil/ coolant.
	Examine oil pressure relief valves for proper functioning.
	Set & regulate in fuel injection timing Bleeding diesel fuel

	system.
	Examine & ensure proper functioning of Oil coolers and oil Galleries.
	Conduct overhauling of water pump/ fuel tank/ fuel feed Pump/ electrical pump/ fuel filters/oil pump.
	Trace oil / coolant leakage from the engine.
	Assess and ensure radiator pressure cap for proper functioning.
	Maintain procedures for regular functioning of lubrication and cooling system.
4. Diagnose, Service and Maintain Electrical System viz. Battery, Starting system, Charging System and Ignition system. (NOS:ASC/N9443)	Check and monitor starter and charging circuit/ solenoid switches for proper functioning.
	Check battery condition using hydrometer/ battery tester.
	Examine starter and charging units.
	Conduct Voltage drop test for charging system.
	Perform overhauling of Alternator.
	Inspect Magneto for proper strength.
	Set magneto ignition timing using timing light.
	Check & test ignition circuit for proper functioning.
	Analyze battery condition using hydrometer and battery tester.
	Monitor Maintenance, diagnosis and servicing of battery.
	Detect fault and apply remedial measure.
	Plan & Prepare Electrolyte, charge batteries in series & parallel combination.
	Monitor & reconditioning of terminal post.
	Monitor Overhauling of distributor.
	Check & test ignition coil, spark plug, condenser for proper functioning using testing equipment
	Set ignition timing & check it using ignition timing light.
5. Plan &execute servicing &maintenance of Emission Control System & monitor the conduction of Emission Control Test. (NOS:ASC/N9444)	Monitor & Examine exhaust gas of petrol engine using exhaust gas analyzer.
	Check & review the exhaust gas of Diesel engine using smoke meter.
	Perform servicing & maintenance of crank case ventilation system and EGR system.
	Demonstrate working of Emission control system as per prescribed standard.
6. AssessEngine Performance tests, lighting system tests, using various tools; diagnose& trouble shoot them. (NOS:ASC/N9445)	Monitor Trouble tracing in lighting system, Head light alignment.
	Analyze Trouble tracing digital dashboard gauges
	Examine & perform servicing of Horn / Wiper motor circuit.
	Conduct Morse test using dynamometer and tachometer & determine the mechanical efficiency of the engine.
	Determine & assess air consumption and lubricating oil consumption.
	Examine Engine Management system

	Conduct Airflow measurement
	Examine Electrical Fuel injection wiring system
	Ensure proper working of Data link connector and Onboard Diagnostic system.
	Inspect Sensors and Actuators/ Pumps.
	Check &troubleshoot Diagnostic Trouble code (DTC)
	Identify the faults by trouble code, check intermittent problems.
	Analyze nature of trouble and resolve it
	Conduct final confirmation test.
7. Plan & execute servicing and testing of different fuel injection pumps, manage independently overhauling of injectors. (NOS:ASC/N9446)	Inspect fuel injection pumps using test bench & ensure its maintenance.
	Examine distributor type fuel injection pumps.
	Examine low pressure and high pressure fuel supply circuit.
	Check & ensure proper functioning of fuel pump operation.
	Inspect fuel injector for leakage.
	Ensure Fuel regulator functioning.
	Conduct Assembly and Disassembly of CRDI pump from engine.
	Monitor & adjust speed of engine.
	Examine and ensure Injectors for proper functioning
	Inspect all the components of CRDI System.
8. Diagnoseand perform overhauling of Tractor Transmission System and check Tractor Wheels and tubes for replacement. (NOS:ASC/N9447)	Examine Clutch Assembly.
	Check & adjust clutch master slave cylinder/ paddle play for correct functioning.
	Assemble and disassemble Gearbox.
	Examine Gearbox assembly for wear / defects.
	Monitor proper functioning of Gearbox.
	Examine Differential and final drive.
	Inspect backlash of Gears.
	Check & connect Differential lock and PTO shaft.
	Inspect Oil leakage.
	Conduct Field operation after ensuring Transmission fitting.
	Perform & Analyze servicing of distributor
	Inspect Hydraulic connections/ hydraulic jacks coupling.
	Conduct & review field operation of agricultural machinery with linkage system and auxiliary hydraulic system.
	Remove tyre from tractor by following proper procedure.
	Inspect tyres for wear and tubes for leaks.
	Conduct refitting of tyres and tubes and ensure for correct pressure.
	Conduct fitting of wheels and ensure tightening of nuts in proper sequence .
	Comply safety precautions while wheel removing and fitting.
9. Plan & schedule overhauling	Demonstrate steering system layout.

of different types of Steering system/ brake system and maintenance of Tractor & Air Conditioning of Tractor. (NOS:ASC/N9448)	Inspect Steering linkage and analyze necessary repair to be done.
	Conduct Removal of Steering gear box from tractor for examination.
	Plan & Remove front axle/ spindle hub / steering linkage.
	Plan & Set wheel track front & rear and Ground clearance.
	Demonstrate layout of Hydraulic steering system
	Inspect Hydraulic pump and steering distributor for proper functioning and ensure hydraulic connections.
	Reassemble and ensure for correct functioning.
	Examine mechanical (shoe /disc) brakes for wear/ tear and damage.
	Conduct relining of brake shoe / inspect parking brakes.
	Remove & Dismantle master cylinder / wheel cylinder
	Inspect master cylinder, wheel cylinder and it's piston and valves.
	Conduct replacement of washer and oil seals.
	Perform bleeding and adjustment of hydraulic brakes
	Conduct field test for proper functioning of brake.
	Examine and service Air conditioning system components.
10. Drive Tractor on field, schedule maintenance operation of tractor and execute Hitching and unhitching of Agricultural Implements. (NOS:ASC/N9449)	Conduct scheduled maintenance after 10, 50, 100, 250, 500, 1000 hours of operation of tractor
	Conduct Driving test with different implements.
	Troubleshoot in driving tractor & test its performance.
	Plan & organize Workshop adjustments of Hitching and unhitching of Agricultural implements.
	Examine Field operation of agriculture implements.
	Perform adjustment on implements and ensure for its proper functioning.
11. Read and apply engineering drawing for different application in the field of work. (NOS:ASC/N9410)	Read & interpret the information on drawings and apply in executing practical work.
	Read &analyze the specification to ascertain the material requirement, tools and assembly/maintenance parameters.
	Encounter drawings with missing/unspecified key information and make own calculations to fill in missing dimension/parameters to carry out the work.
12. Demonstrate basic mathematical concept and principles to perform practical operations. Understand and explain basic science in the field of study. (NOS:ASC/N9411)	Solve different mathematical problems
	Explain concept of basic science related to the field of study

8. INFRASTRUCTURE

LIST OF TOOLS AND EQUIPMENT FOR MECHANIC TRACTOR - CITS			
For batch of 25 candidates			
S No.	**Name of the Tools & Equipment**	**Specification**	**Quantity**
A. TRAINEES TOOL KIT			
1.	Steel rule	150 mm(graduated both English and metric) as per IS 1481	25+1 nos.
2.	Steel rule	300mm(graduated both English and metric) as per IS 1481	25+1 nos.
3.	Steel measuring tape	10 meter in a case.	25+1 nos.
4.	Engineers Try Square	150 mm with knife edge as per IS 2013	25+1 nos.
5.	Outside Caliper	15 cm spring type	25+1 nos.
6.	Inside Caliper	15 cm Spring type	25+1 nos.
7.	Dividers	15 cm Spring type	25+1 nos.
8.	Safety glasses		25+1 nos.
9.	Scriber	15 cm	25+1 nos.
10.	Knife double Blade Electrician		25+1 nos.
11.	Wire insulation Stripper for shinning conductors	from 0.4mm to 4mm	25+1 nos.
12.	Electrician testing Pencil	(Line / Neon tester)	25+1 nos.
13.	Electrician Screw Driver	250mm	25+1 nos.
14.	Centre punch	10 cm	25+1 nos.
15.	Chisel cold flat	20mm X 150mm	25+1 nos.
16.	Hammer ball peen .	0.5Kg with handle	25+1 nos.
17.	Screw driver	20 cm X 9mm blade	25+1 nos.
18.	Screw driver	30 cm X 9 mm blade	25+1 nos.
19.	Spanner D.E.	Set of 12 pieces (6mm to 32mm) as per IS2028	25+1 nos.

20.	Combination	20 cm	25+1 nos.
21.	Side cutting Pliers	15 cm	25+1 nos.
22.	Round nose Pliers	15 cm	25+1 nos.
23.	Flat nose Pliers	15 cm	25+1 nos.
24.	Hand file	20 cm. Second cut flat	25+1 nos.
25.	Hand file	20 cm. Second cut half-round	25+1 nos.
26.	Hand file	20 cm. smooth triangular	25+1 nos.
27.	Hand file	30 cm. bastard	25+1 nos.
28.	Hand file	30 cm. round bastard	25+1 nos.
29.	Ring spanner	set of 12 pieces(6mm to 32mm)	25+1 nos.
30.	Feeler gauge	20 blades(metric)	25+1 nos.
31.	File card or cleaner		25+1 nos.
32.	Wire cutter and stripper		25+1 nos.
33.	Allen key	set of 12 pieces(2mm to 14 mm)	25+1 nos.
34.	Steel tool box with lock and key .	(folding type) 400x200x150 mm	25+1 nos.
B. INSTRUMENT AND GENERAL SHOP OUTFIT			
Instruments			
35.	Outside micrometer	0 to 25 mm with least count 0.010mm as per IS 2967	2 nos.
36.	Outside micrometer	25 to 50 mm with least count 0.010mm as per IS 2967	2 nos.
37.	Outside micrometer	50 to 75 mm with least count 0.010mm as per IS 2967	2 nos.
38.	Outside micrometer	75 to 100 mm with least count 0.010mm as per IS 2967	2 nos.
39.	Inside micrometer	25 -50,50-75,75-100,100-125,125-150mm, with least count 0.01mm	2 each
40.	Depth micrometer	0-25mm with least count 0.010mm	2 nos.
41.	Thread Micrometer	0-25mm with least count 0.010mm	2 nos.
42.	Adjustable micrometer sprit level to measure flatness, indication and taper	with prismatic measuring base	2 nos.
43.	Vernier caliper	200mm inside and outside (graduated in inches and millimetres)	1no.
44.	Digital Vernier calliper outside	300mm least count 0.01mm	2 nos.

45.	Vernier depth Gauge	0-150 mm	2 nos.
46.	Vernier bevel protractor	, least count 5minutes as per IS 4239	2 nos.
47.	Telescope gauge		2 nos.
48.	Dial test indicator plunger type	(complete with clamping devices and stand)	4 nos.
49.	Universal Surface gauge		2 nos.
50.	Cylinder bore gauge	capacity 20 to 160 mm	2 nos.
51.	Compression testing gauge	suitable for petrol engine.	2 nos.
52.	Vacuum gauge	to read 0 to 760 mm of Hg.	2 nos.
53.	Granite Marking table	1000X630X150 mm with adjustable stand as per IS7327	1 no.
54.	Granite surface plate ,	Grade 0,630 x 630 x 100 mm with adjustable stand as per IS7327	1 no.
55.	Calipers	15 cm Hermaphrodite	2 nos.
56.	Chisels cross cut	200 mm X 6mm	2 nos.
57.	Chisel	10 cm flat	2 nos.
58.	Ball Peen Hammer	0.75 Kg	2 nos.
59.	Hammer copper	1 Kg with handle	2 nos.
60.	Hammer	Mallet	2 nos.
61.	Hammer	Plastic	2 nos.
62.	Hammer ball peen	0.25 kg with handle	2 nos.
63.	Philips Screw Driver	set of 5 pieces (100 mm to 300 mm)	5 sets
64.	Insulated Screw driver	30 cm x 9mm blade	2 nos.
65.	Insulated Screw driver	20 cm x 9mm blade	2 nos.
66.	Electric testing screw driver		2 nos.
67.	Hand vice –	37 mm	2 nos.
68.	Work bench	240 x 120 x 75 cm with 4 vices 15cm Jaw	5 nos.
69.	Magnifying glass	75mm	2 nos.
70.	'V' Block	75 x 38 mm pair with Clamps (Hardened and ground) as per IS2949	2 nos.
71.	C Clamps	100mm	2 nos.
72.	C Clamps	150mm	2 nos.
73.	C Clamps	200mm	2 nos.
74.	Spanner,.	adjustable upto15cm	2 nos.

75.	Spark plug spanner	14mm x 18mm x Size	2 nos.
76.	Spanners socket with speed handle, T-bar, ratchet and universal	up to 32 mm set of 28 pieces with box	2 nos.
77.	Pipe wrench	350 mm	2 nos.
78.	Spanner T. flex for screwing up and up-screwing inaccessible		2 nos.
79.	Spanner Clyburn	15 cm	1 no.
80.	Magneto spanner	set with 8 spanners	1 set
81.	Piston ring filing jig		2 nos.
82.	Cylinder ridge cutter		1 no.
83.	Vice grip pliers		25nos
84.	Circlip pliers Expanding and contracting type	15cm and 20cm each	25nos
85.	Grip Wrench	200mm	2 nos.
86.	Torque wrenches	5-35 Nm, 12-68 Nm & 50-225 Nm	1 each
87.	Pneumatic tools set		1 no.
88.	Air impact wrench		1 no.
89.	Air ratchet		1 no.
90.	Air chisel		1 no.
91.	Air blow gun		1 no.
92.	Car Jet washer		1 no.
93.	Pipe flaring tool		1 no.
94.	Pipe cutting tool		1 no.
95.	Universal puller for removing pulleys, bearings		1 no.
96.	Cleaning tray.	45x30 cm	4 nos.
97.	Cleaning tray-	Aluminium 45 x 30 cm	4 nos.
98.	Stud extractor set of 3		2 sets
99.	Stud remover with socket handle		1 no.
100.	Paraffin pressure Gun		2 nos.
101.	Grease Gun		2 nos.
102.	Hacksaw frame adjustable	20-30 cm	4 nos.
103.	Files assorted sizes and types including safe edge file (20 Nos)		2 set
104.	Drill twist, metric straight shank	3 mm to 12 mm in step of 0.5 mm	1 set
105.	Drill point angle gauge		1 no.

106.	Set of stock and dies - UNC, UNF and metric		2 sets each
107.	Taps and wrenches - UNC, UNF and metric		2 sets each
108.	Taps and Dies complete sets (5 types)		1 set each
109.	Hand reamers adjustable	10.5 to 11.25 mm, 11.25 to 12.75 mm, 12.75 to 14.25 mm and 14.25 to 15.75 mm	2sets each
110.	Lapping abrasives (consumable)		As required
111.	Oil can	0.5/0.25 litter capacity	2 nos.
112.	Oil Stone	15 cm x 5 cm x 2.5 cm CONSUMABLE	1 no.
113.	Straight edge gauge	2 ft	1 no.
114.	Straight edge gauge	4 ft	1 no.
115.	Thread pitch gauge metric,	BSX, BSF, MC, MF & SAE	1 each
116.	Ladle	150mm Dia	1 no.
117.	Blow Lamp	1 litre	2 nos.
118.	Crow bar	910 x25mm	2 nos.
119.	Voltmeter	50V/DC	5 nos.
120.	Ammeter	300A/ 60A DC with external shunt	5 nos.
121.	DC Ohmmeter s	0 to 300 Ohms, mid scales at 20 Ohm	1 no.
122.	Electric Soldering Iron	230 V 60 watts 230 V 25 watts	2 each
123.	Copper bit soldering iron	0.25 Kg	5 nos.
124.	Thimbles of different sizes		02 nos
125.	Wire Gauge (metric)		5 nos.
126.	Hand operated crimping tool (i) for crimping up to 4mm and (ii) for crimping up to 10mm		2 nos.
127.	Hand rubber gloves	Tested for 5000 V CONSUMABLES	5 pairs
128.	Digital Multimeter	0-500v AC/DC, 0-10A AC/DC, 3½ Digit(min),Diode test mode and continuity mode, accuracy ±0.01%	5 nos.
129.	Growler		1 no.
130.	Scientific Calculator		1 no.
131.	Hydrometer) CONSUMABLE		10 nos.
132.	High rate discharge tester (cell tester)		5nos.

133.	Spray Gun (Painting)	500ml	1 no.
134.	Carburettor – Solex, Mikuny for dismantling and assembling		1 each
135.	Carburettor repair tool kit		1 no.
136.	Starter motor axial type, pre-engagement type & Co-		
137.	Axial type Distributor–Duel advance type, reluctance type		(33 each)
138.	Tester sparking plug 'NEON' Type		1 no.
139.	Alternator assembly		2 nos.
140.	Starter motor assembly		2 nos.
141.	Fuel feed pump		1 no.
142.	Inline fuel injection pump and rotor type fuel injection pump		1each
143.	Drift copper	10 mm dia x 150 mm	2 nos.
144.	Piston ring compressor		2 nos.
145.	Piston ring expander		1 no.
146.	Valve spring compressor		1 no.
147.	Valve seat cutter complete set with guide and pilot bar (all angle in a box)		1 set
148.	Timing light		1 no.
149.	Tachometer		1 no.
150.	Battery	12V (Lead acid &Alkaline)	4 nos.
151.	Electrical horn (different types)		2 sets
152.	AC alternator slip ring puller		1 no.
153.	Executive Auto Electrical tool kit		2 nos.
C. GENERAL SHOP OUTFIT			
1.	Demonstration board of 2Wheeler Ignition system.		1 no.
2.	Demonstration board of electronic Ignition system.4W		1 no.
3.	Spark Plug cleaning and testing equipment		1 no.
4.	Working Condition of Petrol MPFI Engine Assembly with fault simulation board	MPFI	2 nos.
5.	MPFI petrol engine with swiveling stand along with special tools for dismantling and assembling		2 nos.
6.	Demonstration board of MPFI system		1 no.

7.	Ultrasonic Injection cleaning equipment		1 no.
8.	Working Model of power windows		2 nos.
9.	Petrol Engine(2-stroke) Motor Cycle/Scooter along with special tools and accessories		2 nos.
10.	Cut model of 4 stroke Petrol engine on stand		1 no.
11.	Cut model of 2 stroke Petrol engine on stand		1 no.
12.	Mechanical Hoist/Plate Form Type		1 no.
13.	Multi scan tool /ECU diagnostics kit		1 no.
14.	Four stroke multi cylinder diesel engine in working condition		4 Nos.
15.	Four stroke four cylinder CRDI diesel engine in working condition		2 Nos.
16.	Functional/experiment model of different type of sensors		1 set
17.	Auto Electrical test bench		2 Nos.
18.	Cut section Model of Mock layout of a motor car –electrical system – working model		1 set
19.	Battery charger	6 – 72 v for charging with cut off circuit	1no
20.	Trolley type portable air compressor single cylinder with 45 liters capacity Air tank, along with accessories & with working pressure 6.5		1 no.
21.	Grinding machine (general purpose) D.E. pedestal	with 300 mm dia wheels rough and smooth	1 no.
22.	Portable electric drill Machine		1 no.
23.	Spring tension tester		1 no.
24.	Valve refacing machine		1 no.
25.	Injector testing machine for diesel		1 no.
26.	Smoke meter for Diesel with camera and printer		1 no.
27.	Exhaust gas analyzer with camera and printer		1 no.
28.	Connecting rod alignment fixture		1 no.
29.	Engine lifting crane (jib)		1 no.
30.	Oil draining trolley		1 no.
31.	Engine cranker	12v/24v,upto 500 amps to start engine	1 no.

32.	Assembly of working model of wiper along with wind sheild		02 Nos.
33.	Wiper motor assembly		2 nos.
34.	Car stereo		1 no.
35.	Air Compressor capacity	12 c.ft. piston type with pressure gauge (for insulating of tubes etc	1
36.	Chain and pulley block	3000 kg. Capacity electric type	1
37.	Disk brake with caliper assembly fitted on stand		2
38.	Drilling machine	electric pillar type up to 20 mm dia.	1
39.	Dynamo meter for performance testing of engine.		1
40.	Electric Arc welding Set portable		1
41.	Front axle with hub fitted on stand		1
42.	Grinder bench	with two 18 cm wheels with hand grinding attachment	1
43.	Grinder electric pedestal	with two 30 cm. wheel	1
44.	Hydraulic jack with trolley	capacity 3 Ton	1
45.	Injector testing set (Hand tester)		1
46.	Lifting jack screw type.	3050 kg	1
47.	Rear axle assembly-gear box steering box		1
48.	Screw jack one tone, capacity double lift		2 Nos.
49.	Steering gear box hydraulic type mounted on stand		1
50.	Steering gear box with drop arm and push rod Mechanical stand		1
51.	Valve re-facing machine.		1
52.	Washing unit/Car Washer		1
53.	Wheel alignment gauge		1
54.	Tractor	35 to 45 HP with A/C	1
55.	Tractor with power steering	60 HP Fitted With all accessories	1
56.	Cultivator 9 tine spring loaded.		1
57.	Disc harrow Trailing type		1
58.	Disc plough 2-furrow with scrapers.		1
59.	Equipment carrier		1
60.	Mould Board plough		1

61.	Seed cum fertilizer Drill		1
62.	Bench vices	12.5cm Jaw	04 Nos.
63.	Work bench	295 X 120 X 80 cm	2 Nos.
64.	Induction stove –	230 V	01 No.
65.	Beaker (consumable)		01 No.
66.	Thermometer.	Range Max 150 deg C	01 No.
D. Special Tools			
67.	Allen key	set of 12 pieces (2 mm to 14 mm)	2set
68.	Blow lamp (LPG)	with 5 Kg. cylinder.	1 set
69.	Cylinder ridge remover/ cutter		1
70.	Dial test indicator	Toread 0.25 mm	1
71.	Drill hand Pneumatic / Elect. Type.		1 each
72.	Ex-tractor stud (EZYOUT TYPE)		2
73.	Fire buckets with stand		4 Nos.
74.	Fire extinguisher Cap. 4.5 kgs. (CO_2) type		2 Nos.
75.	Grease gun, pressure type.		One
76.	Horses and wheel choke		4 each.
77.	Hydraulic pump, ram & distributor		1 each
78.	Pipe wrench	350 mm /450 mm	1 each
79.	Puller mechanical/ hydraulic powered with attachments.		1 each
80.	Pullers for steering wheel universal type		1
81.	Pullers set for bearing & bushes universal type		2 Nos.
82.	Punch letter set.		1 set
83.	Snip bend/ straight.		2Nos. each
84.	Soldering iron	120 Watt	2 Nos.
85.	Soldering iron copper	280 gm (fire heated).	2 Nos.
86.	Spanner socket pneumatic / Power tool kit		1
87.	Spanner, T-flax for screwing up and screwing in inaccessible position.		1
88.	Spanners adjustable	20 cm.	2 Nos.
89.	Spare parts of tractor		As required
90.	Stone, carburandum	15 x 5 x 4 cm smooth and rough. (consumable)	1
91.	Surface plate.	60 x 60 cm	1
92.	Torque wrench	(0 to 40 kg. meter)	1
E. CLASS ROOM FURNITURE			

93.	Instructor's table and Chair (Steel)		1 set
94.	Students chairs with writing pads		25nos.
95.	White board size	1200mm X 900 mm	1 no.
96.	Instructors lap top with latest configuration pre-loaded with operating system. and MS Office package.		1 no.
97.	LCD projector with screen.		1 no.
98.	CD & DVD of different joint related to carpenter works and variety design of modern furniture		1 set each (optional)
99.	Visualizer (latest configuration)		1 no.


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