Model Curriculum

Tractor Mechanic

SECTOR: AGRICULTURE & ALLIED
SUB-SECTOR: AGRICULTURE CROP PRODUCTION
OCCUPATION: FARM MACHINERY EQUIPMENT OPERATION & MAINTENANCE
REF ID: AGR/Q1108, V1.0
NSQF LEVEL: 4

Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

AGRICULTURE SKILL COUNCIL OF INDIA

for the

MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Tractor Mechanic' QP No. 'AGR/ Q1108 NSQF Level 4'

Date of Issuance: February 28th, 2017

Valid up to: March 31st, 2020

* Valid up to the next review date of the Qualification Pack

Authorised Signatory
(Agriculture Skill Council of India)

TABLE OF CONTENTS

Tractor Mechanic

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a "Tractor Mechanic", in the "Agriculture & Allied" Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	**Tractor Mechanic**		
Qualification Pack Name & Reference ID. ID	AGR/Q1108		
Version No.	1.0	**Version Update Date**	
Pre-requisites to Training	Class 10, Preferably		
Training Outcomes	**After completing this programme, participants will be able to:** ▪ **Identify/familiarize with Tractors & Its Applications:** Understand the working of different Tractor aggregates like Engine, Clutch, Gear box, Rear axle, Hydraulics, Steering & Electrical systems. Understand the tractor applications & implements used. ▪ **Carryout Routine maintenance in Tractor:** procedure to do periodical checking, servicing and maintenance in Tractor ▪ **Undertake overhauling and repair of Tractor Engine:** Diagnosing and rectifying the defects in Tractor Engine ▪ **Undertake overhauling and repair of Tractor Transmission, Hydraulics & Electricals:** Diagnose and rectify the defects in Tractor transmission, hydraulics ,steering & Electrical systems ▪ **Practice health & safety at the work place:** Well versed with health and safety measures in terms of personal as well as others' safety and introduction to Dangerous Machinery Regulation Act.		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of "Tractor Mechanic" Qualification Pack issued by "Agriculture Skill Council of India".

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	**Introduction** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 00:00 **Corresponding NOS Code** Bridge Module	• Understand General Discipline in the class room & Workshop (Do's & Don'ts) • Scope & importance of Farm Mechanization/Tractor industry in India • Get acquainted with different Tractor manufactures & their brands/models • Understand the role of a Tractor Mechanic and the progression pathways	Laptop, white board, marker, projector and video films & Presentations
2	**Prepare for carrying out tractor repair and maintenance** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 30:00 **Corresponding NOS Code** AGR/N1126	• Identify types of tractor, their uniqueness • Understand different power outlets of tractor – Wheel, PTO &Hydraulics • Basic terminology regarding Tractors –Engine HP, PTO HP, Drawbar HP, Hydraulic HP, CC, Torque, Traction, RPM, Engine rated rpm, Low idle & High idle rpm, Wheel base, Wheel track, ground clearance etc., • Recognize the information in Data plate & Aggregates –Tractor serial number, Engine serial number, Chassis (Transmission/backend) number. • Recognize the different gauges & its purpose in Instrument cluster (Dash board) – Fuel gauge, Temperature gauge, Engine oil pressure gauge, Battery charging indicator, RPM meter, hour meter, Air filter choke indicator (In Dry Air filter engine), 4WD engagement indicator etc., • Recognize the location & purpose of Aggregates – Engine, clutch, Gearbox, Rear axle, PTO, Hydraulics & Electricals. • Operate different controls –Gear levers, Hydraulic levers, PTO lever, Differential lock,3 point linkage, Hand and foot throttle, clutch pedal, brake pedal etc., • Recognize different applications of tractors: Agricultural –Tillage, sowing, Crop care, Harvesting & Post harvesting.	Inside the Class room - Laptop, white board, marker, projector and Video films, Presentations, Operator manual (with specifications) on Tractor applications & Implements. Outside the class room/Workshop – Tractor, Major implements- Cultivator, Harrow, Rotary tiller, MB plough or Disc plough. General tools set – Ring spanner set, Open end spanner set, Socker spanner set, T handle, speed handle, Different size extensions ,Screw drivers , Allen key set, Mallet, Hammer set , Chisel, Different pliers –Circlip plier (Inner & outer) , nose plier, Cutting plier, grip plier. Special service tools set –Pullers, Replacer, Drift and other tools recommended by manufacturer Machining tools –File set –Round, square (Rough & smooth), Hack shaw set, Drill bits, taps Equipment - machine vice, Air compressor, washing machine

		Commercial –Haulage, compressor, alternator etc. • Recognize the purpose & types of different Implements/attachments- Cultivator, Harrow, Rotary Tiller, MB Plough, Disc plough, Seed drill ,planter, sprayer, reaper, Tractor mounted harvester, Thresher, baler, 2 Wheel Trailer, 4 Wheel trailer, Tipping trailer, Air Compressor. • Recommend the compatible implement (type & size) as per the Tractor HP, Soil condition & Farmer's need • Read Operator manual and follow the instructions • Read Decals in the tractor for the safe and proper operation of the tractor. • Properly hitch the implement using Top link & RH Levelling rod • Recommend the required mast height & Top link angle while hitching (Top link should be down ward in front end). • Recommend the correct hitching hole for the top link (as per the soil condition –Hard/medium or soft) • Operate the tractor & all the controls –Especially Hydraulic levers & PTO lever • Use and recommend the correct hydraulic lever usage to the farmer as per the implement. - Draft lever/Draft Mode -Primary tillage implements like MB Plough, Disc plough, Sub-soiler, Cultivator. - Position lever/Position mode – Other implements like Harrow, Rotary tiller, Seed drill, planter, while hitching trailer in toe hook. • Use and also recommend the correct gear selection, Engine rpm & PTO RPM selection as per the manufacturer recommendation & implement • Recognize the different standards used in General tools – Metric (mm)& Imperial(Inches) • Select & Use the General tools properly – Ring spanner, Open end spanner, Socket (Box spanner),T rod, speed handle, Screw driver, Circlip plier, Nose plier, cutting plier, Mallets & Hammers. • Select & use of special service tools • Use the reconditioning tools –File, Hack Shaw, Taps etc., • Use the following measuring tools • Steel rule, Measuring tape, Depth gauge, tyre pressure gauge, Feeler gauge, Tyre pressure gauge, Tacho meter, Torque wrench, Dial gauge, Vernier caliper, Micometer , Dial bore gauge, hydrometer & multimeter. • Use the equipment -machine vice, Air compressor, washing machine ,power cutter, drilling machine ,hydraulic jack, pneumatic tools	,power cutter, hand drilling machine, hydraulic jack, welding machine & Pneumatic tools

3	**Perform necessary routine checks and maintenance of the tractor** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 25:00 **Corresponding NOS Code** AGR/N1127	• Read the manufacturer's manual, the maintenance schedule and understand the different checking points, technical specifications, Lubrication Chart, Lubricant quantity, Grade & Changing interval • Test the tractor by Road test to check working of the engine, clutch, gears, brakes and steering • Wash the tractor before the service • Check the function of all the gauges & lights • Change Engine, Transmission, Rear Axle & Steering oil • Change Engine oil Filter, Turbo filter, Fuel Filter & Hydraulic filter • Cylinder Head Nuts Tightening Adjustment • Valve clearance adjustments • Fan belt Adjustment • Check & Adjust Clutch pedal play • Check & Adjust Brake pedal play • Check & Adjust Front wheel hub play • Check & Adjust Steering play • Check & Adjust Toe In • Check the torque of all nuts and bolts, tighten if required • Undertake Radiator /Recovery bottle check & fins cleaning • Check Any Leakage • Check the battery • Check difference in sound from aggregates while running • Check Tyre pressure • Check Battery electrolyte level & top up • Clean FIP Pre Filter Elements • Clean Dry Air cleaner outer element/ Oil bath type air filter cleaning • Clean Diesel Filters sediment bowl • Clean/Drain water separator • Clean Fuel Cock strainer • Air bleeding in Fuel system • Wash the tractor • Grease all the points including front hub • Adjusting Engine idle RPM • Valve guide oil seal -Removal & replacement • Remove Radiator – Flush & assemble • Inspect Thermostat valve • Separate the tractor for Inspection & repair in Clutch, release bearing, etc • Clutch release lever height settings - Single & Dual clutch • Gear Box Shifting cover - dismantling, Inspection , Repair & assembling • Brake assly dismantling, Inspection ,Repair & assembling • Adjust Wheel Track	Tractor, General tool set, Operator manual, maintenance schedule chart, Service specifications , lubrication chart, Lubricant oil, grease, Filters Measuring tools-Steel rule, measuring tape, Torque wrench, feeler gauge, tyre pressure gauge, Dial gauge, Hydrometer, Multimeter. Equipments: Water Washing unit, Greasing gun, Air compressor, Hydraulic or mechanical jack

		• Replace Brake oil seal • Replace PTO oil seal • Bleeding of air in the hydraulic system • Find and resolve the Front wheel rim Run out • Inspect the battery using hydrometer • Do Water ballasting in Rear wheels	
4	**Carry out overhauling and repair of engine** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 35:00 **Corresponding NOS Code** AGR/N1128	• Recognize Types, construction, working principles and parts of tractor Engine • Understand working of a four-stroke diesel engine • Get acquainted with construction, working principle and parts of fuel supply system, air intake and exhaust system , cooling system, lubrication system, Timing gear & valve operating systems. • Diagnose the defects and causes by observing symptoms • Conduct engine compression test to decide on Overhaul • Dismantle the engine with proper Special service tools & hand tools and by following proper sequence • Undertake Visual Inspection of the parts for any abnormality • Inspection of following engine parts using measuring tools: ▪ Cylinder Bore Diameter ▪ Maximum permissible cylinder liner wear ▪ Maximum permissible ovality cylinder ▪ Taper of cylinder bore ▪ Cylinder liner protrusion ▪ Cylinder block surface flatness ▪ Skirt to cylinder wall clearance ▪ Grading diameter of the piston ▪ Protrusion of the piston ▪ Ring clearance –Land clearance & End clearance of all rings ▪ TAPPETS-Tappet diameter ▪ Permissible tappet guiding portion cylindricity ▪ Tappet bore ▪ CRANK SHAFT-Main journal diameter ▪ Big end journal diameter ▪ Main journal wear limits ▪ Fillet radius ▪ Crank shaft rear oil seal journal diameter ▪ Crank shaft end float ▪ MAIN BEARING BORE MEASUREMENT: ▪ Main bearing shell inside diameter ▪ Main bearing working clearance ▪ Main bearing wear limit ▪ Run-out of rear main oil seal ▪ Run-out of fly wheel ▪ CAM SHAFT:	In Class room - Laptop, white board, marker, projector , video films & Presentations In Workshop : Tractor, Engines with stands, General tools set, Special service tools set, Measuring tools set, Service manual. Equipment like Water Washing unit, Greasing gun, Air compressor, Hydraulic or mechanical jack

		• Cam bush inner diameter • Cam shaft bearing clearance • Cam shaft bearing journal diameter • Cam shaft run out • Cam shaft end float • CONNECTING ROD: • Small end bush inner diameter • Clearance between gudgeon pin & bush • Big end bush inner diameter • Maximum permissible twist • Maximum permissible bend • Oil pump drive gear backlash • Oil pump driving gear backlash • Play between impeller and pump body face • Timing Gear Backlash (Check during dismantling) • Cylinder head flatness • Valve face to cylinder head face depth (Inlet & Exhaust Valve) • Inlet valve stem diameter • Exhaust valve stem diameter • Valve guide inner diameter • Valve stem & valve guide clearance • Valve Spring primary deflection • Spring free length • Spring Maximum out of squareness • Rocker arm shaft diameter • Rocker arm bush inner diameter • Rocker arm bush and shaft clearance • Repair or replace the parts if the Dimensions are not under the limit • Re assemble the engine parts using General & special service tools with proper settings/service specification • Set the Valve clearance • Setting the FIP Timing –In line pump & rotary pump • Trouble shoot the engine for following complaints: • Engine is not starting • Low Oil Pressure • High Oil Consumption • High fuel consumption • Lack of Power • Overheating • Excess blow -by • Exhaust smoke • BLUE – results from the burning of the oil • WHITE – it is due to unburned or partly burned fuel • BLACK – it is due to poor combustion	

		• DILUTION - It is mixing of diesel and engine oil. Diesel is noticed to be in sump and lub oil appear to be thinner • Mixing - Water mixing with oil ,Oil mixing with water, Lub oil is noticed in radiator • Knocking sound – Mechanical or due to Misfiring • MISFIRING- firing does not take place at the right time	
5	**Carry out overhauling and repair of transmission, hydraulic and tractor electrical systems** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 60:00 **Corresponding NOS Code** AGR/N1129	• Recognize Types, construction, working principles of Tractor clutch -Single, dual & Independent clutch • Separate the tractor unit using splitting rail to examine clutch assembly • Inspect the clutch release lever height and Release bearings • Dismantle the clutch assembly from fly wheel and asses the Fly wheel, Clutch disc, pressure plate, Clutch spring & cover assembly for wear limit and to check for abnormality • Assemble the clutch unit with correct settings using general & special service tools • Trouble shoot the clutch for following complaints: ▪ Clutch Slippage ▪ Clutch pedal is hard to operate ▪ Clutch is noisy ▪ Clutch vibrates/Judder • Gear box - Recognize Types, construction, working principles of Gearbox – Sliding mesh, constant mesh & Synchromesh /8+2 speed, 8+4 speed, 9+3 speed etc., • Understand gear ratio and it's importance wrt speed and torque of the tractor • Explain the power flow in different gears • Diagnose the gear box and taking the decision on partial or complete dismantling • Inspect the shaft, gears, bearings, seals for any abnormality – Endplay, backlash, damage, wear etc., • Take corrective actions by repairing or replacing the parts • Assemble the Gear box with correct settings and sequence using General & special service tools • Trouble shoot the Gearbox for following complaints: ▪ Hard shifting ▪ Slips out of gear ▪ Repeated gear Failure ▪ Noise in gear box ▪ Loss of drive ▪ Double gear engagement	In Class room - Laptop, white board, marker, projector , video films & Presentations In Workshop : Tractor, Tractor aggregates with stands 1.Clutch –Single, Dual & Independent, 2.Gear box, 3.Rear axle, 4.Hydraulics, 5.Steering –Mechanical & power steering units, 6.Hydraulic power lift unit Service manual or Training handout for reference General tools set, Special service tools set, Measuring tools set Equipment mechanical jack, Tractor splitting rail, hydraulic pressure gauge, Jib crane

		• Recognize Types, construction, working principles of Rear axle .Final reductions - Single reduction, Bull & pinion (Inboard), Bull & pinion (Hub reduction) & Epicyclic (Planetary) types. Differential & wheel assembly. • Recognize Types, construction, working principles of Brakes – Dry disc & Oil immersed brakes (OIB) • Recognize Types, construction, working principles of PTO –Non live, Live & Independent PTO/Single speed, Dual speed, multi speed, reverse speed & Ground PTO. • Diagnose the Rear axle, Brakes & PTO for complaints. Taking the decision based on the symptoms • Dismantle the Rear Axle parts with correct sequence using general & special tools - Differential, Final reduction (Bull & pinion or Epicyclic (Planetary) reductions), Brakes –Dry disc / OIB & PTO shaft. • Inspect the Rear axle components for abnormality – Play, Wear, damage, leakage etc., • Repair or replace the defective parts • Assemble the Rear axle with correct settings and sequence using General & special service tools • Trouble shoot the Rear Axle for following complaints: ▪ Noise –Intermittent, Noise on turn, Constant noise, Humming noise ▪ Loss of drive ▪ Wheel doesn't run true ▪ In Brakes –Long pedal travel, spongy pedal, Tractor pulls one side, Brake fade, judder in pedal, Brake binding, Hard pedal & Poor braking • Recognize Types, construction, working principles of **Hydraulics system** • Operate Hydraulic levers correctly –draft & position mode • Understand the components of hydraulics system, Reservoir, Pump, Distributor, Ram cylinder, Linkages, Draft spring units. • Recognize the Hydraulic circuit in Neutral, Lifting & Dropping operations • Diagnose the hydraulics system & taking decision on Dismantling. • Do Hydraulic pressure test using gauge • Dismantle the Hydraulic components - Pump, Distributor, Ram cylinder, Linkages, Draft spring units. • Inspect the parts and decide on repair or replacement • Assemble the parts in correct sequence & settings using general & special tools.	

		• Trouble shoot the hydraulics for the following complaints: ▪ Failure to Lift in all conditions ▪ Failure to Lift under Load ▪ Excessive corrections in the Raised or Transport position ▪ Hydraulic power lift fails to maintain the implement working depth as required, excessive or insufficient working depth ▪ The hydraulic power lift fails to maintain the transport position ▪ Too high oil temperature ▪ Hydraulic stuck in either lower or upper position • Recognize Types, construction, working principles of Steering –Mechanical steering –Recirculating ball type & Worm and roller type; Power steering –hydrostatic steering • Dismantle the mechanical and power steering parts • Inspect the parts for any abnormality –wear, damage etc., • Assemble the Mechanical & Power steering parts with correct sequence & settings using general & special service tools • Recognize Types, construction, working principles of Front axle – 2 Wheel drive front axle (Non live axle) & 4 wheel drive front axle • Dismantle the 2wd front axle & 4 WD front axle • Inspect the parts for any abnormality –wear, damage etc., • Trouble shoot the Steering & Front axle for following complaints ▪ Steering Hard ▪ Steering wobbling ▪ Tractor pulling on one side ▪ Noise, leakage, loss of drive from 4WD front axle • Recognize different electrical parts & its working principle– Alternator, Starting motor, Fuses, Battery, Lights, Switches & wiring harness • Do Basic trouble shooting of electrical: ▪ Battery not charging ▪ Gauges, switches not functioning ▪ Continuity of wiring harness ▪ Starter motor doesn't crank or insufficient cranking ▪ Checking the fuses ▪ Checking & Charging the battery	

6	**Carry out assembly of repaired and serviced parts** **Theory Duration** (hh:mm) 05:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** AGR/N1130	• carry out precise cleaning of fast moving parts/shafts and bearings • carry out lubrication of parts where necessary • follow the reverse sequence as in dismantling • assemble parts in reverse sequence of dismantling • check for any leakages and tighten loose parts if any is detected • Carry out the pre-start check in the tractor & aggregates • Start the engine and observe functioning of all aggregates for a certain period of time	General service tool set, Special service tools set, Washing machine, Diesel, Grease.
7	**Maintain Health & Safety at the work place** **Theory Duration** (hh:mm) 10:00 **Practical Duration** (hh:mm) 10:00 **Corresponding NOS Code** AGR/N9903	• Maintain a clean & efficient workplace • Get acquainted with Dangerous Machinery Regulation Act • Render appropriate emergency procedures • Report to appropriate person on time. • Practice general safety and first aid	Laptop, white board, marker, projector, , Personal protective equipment Like: Helmet / head gear, Cotton / woollen safety gloves, Safety boots, Safety Harness; First Aid Kit: Bandages, Adhesive bandages, Betadine Solution / ointment, Pain relief spray / ointment, Antiseptic liquid; Phone directory, Search lights, fire extinguisher
	Total Duration: **Theory Duration** (hh:mm) **50:00** **Practical Duration** (hh:mm) **170:00**	**Unique Equipment Required:** Tractors, Tractor aggregates with stands – Engine, clutch, Gear box, Rear axle, Hydraulic power lift, steering (mechanical & power steering), Front axle (2WD & 4WD), Cultivator, Harrow, Rotavator, MB Plough & Disc plough.	

Grand Total Course Duration: **220 Hours, 0 Minutes**

*(This syllabus/ curriculum has been approved by **Agriculture Skill Council of India**)*

Trainer Prerequisites for Job role: "Tractor Mechanic" mapped to Qualification Pack: "AGR/Q1108, v1.0"

Sr. No.	Area	Details
1	**Description**	Trainer is responsible for educating the trainees – Tractor maintenance & repair, Function of different aggregates of tractor, tractor usage, Safety & hygiene at the workplace
2	**Personal Attributes**	Trainer should be Subject Matter Expert. He/ she should have good communication, leadership, observation and practical oriented skills.
3	**Minimum Educational Qualifications**	Diploma/ITI in Agriculture /Mechanical/Automobile engineering
4a	**Domain Certification**	Certified for Job Role: "Tractor Mechanic" mapped to QP: "AGR/Q1108, v1.0". Minimum accepted score is 80%.
4b	**Platform Certification**	Recommended that the Trainer is certified for the Job Role: "Trainer", mapped to the Qualification Pack: "SSC/Q1402". Minimum accepted % as per respective SSC guidelines is 70%.
5	**Experience**	• B. Tech (Ag. Engg/Mech/Auto Engg.) with 1 Year relevant experience • Diploma (Ag. Engg/Mech/Auto Engg.) with 3 Years relevant experience • ITI/ Vocational pass out tractor mechanic/ farm machinery/MMV/Diesel mechanic with 5+ years' experience in relevant field

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Tractor Mechanic
Qualification Pack	AGR/Q1108, v1.0
Sector Skill Council	Agriculture

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre(as per assessment criteria below)
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on this criteria
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in aggregate
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

Assessment outcomes	Assessment criteria	Marks Allocation			
		Total Marks	Out Of	Theory	Skills Practical
1. AGR/N1126 Prepare for carrying out tractor repair and maintenance	PC1. identify types of tractor, their components and agricultural/commercial applications		9	3	6
	PC2. identify, understand and monitor working of:		10	3	7
	• types of clutches (single, dual and independent) and actuation mechanisms				
	• working and types of gear box				
	• chassis				
	• IC engine, lubrication, cooling system, air and exhaust system				
	• fuel supply and transmission systems				
	• front and rear axle				
	• steering systems				
	• wheel and tyres				
	• brakes (both dry and oil immersed)				
	• tractor electrical system (charging, starting, wiring harness, instrument cluster,etc)				
	• types of hydraulics system				
	PC3. carry out field trial measurement and check fuel consumption, coverage and depth		9	3	6
	PC4. identify the different applications of a tractor – agricultural and non-agricultural		9	3	6
	PC5. identify and study different agriculture implements		9	3	6
	• seed bed prespatation - tillage implements –mb plow,disc plow,cultivator etc.,				
	• sowing implements – seed drill, planter etc.,				
	• crop care implements – sparyers,irrigation pumps,ridger etc.,				
	• harvesting implements/quipments – reaper,harvertor etc.,				
	• post harvesting implements – thresher,baler etc.,				
	PC6. select implement as per tractor by checking tractor versuss implement compatability		9	2	7

	PC7. hitch and adjust the implements with the tractor		9	2	7
	PC8. drive and operate the tractor with and without implements		9	2	7
	PC9. identify tools required in dismantling and assembling different systems of a tractor		9	3	6
	PC10. identify and select measuring tools and equipments required for repair and maintenance		9	3	6
	PC11. identify and select marking tools as well as OEM recommended special service tools		9	3	6
			100	**30**	**70**
2. AGR/N1127 Perform necessary routine checks and maintenance of the tractor	PC1. read the manufacturer's manual, the maintenance schedule and understand specifications of components and accessories		8	3	5
	PC2. carry out periodical maintenance of tractor (10 hours, 50 hours, 100 hours, 250 hours, 500 hours and 1000 hours)		8	3	5
	PC3. test tractor on the road to check working of the engine, clutch, gears, brakes and steering		8	3	5
	PC4. assess the working of implements such as harrow, rotavator, seed drills, etc		8	3	5
	PC5. carry out fan belt play checks and adjustment		8	2	6
	PC6. check for oil level and leakage of engine, air cleaner, gear box, rear axle and steering		8	2	6
	PC7. change engine oil filter, turbo filter, fuel filter and hydraulic filter		8	2	6
	PC8. check the coolant in the radiator/reservoir tank		8	2	6
	PC9. check for any bleeding or air locks in the fuel system		8	2	6
	PC10. check battery electrolyte level		7	2	5
	PC11. check that the right temperature is maintained in the gauge		7	2	5
	PC12. check for the right oil pressure		7	2	5
	PC13. check that the hour meter is adjusted correctly		7	2	5
			100	**30**	**70**
3. AGR/N1128 Carry out overhauling and repair of engine parts	PC1. identify the types of engines and their components		4	1	3
	PC2. identify and understand the working of engine		4	1	3
	PC3. arrange all prerequisites required for the dismantling process such as tools, wooden blocks, protective clothing,		4	2	2

	etc.				
	PC4. follow the prescribed dismantling procedures as defined in service manual		5	2	3
	PC5. clean the dismantled parts/nuts bolts		4	1	3
	PC6. keep the dismantled parts in a safe and dust free zone		4	1	3
	PC7. carry out visual inspection of all the parts		4	1	3
	PC8. check engine idle RPM and max idle RPM		4	1	3
	PC9. check the working of following Engine systems: • fuel system • lubrication system • cooling system • air intake and exhaust system		5	2	3
	PC10. dismantle and inspect cylinder head, and check whether it requires replacement		4	1	3
	PC11. check water temperature, senors, wiring, gauge, thermostat		4	1	3
	PC12. inspect engine front and rear oil seal and check whether they need replacement		5	2	3
	PC13. remove, flush and re-assemble radiator		4	1	3
	PC14. assess general wear and tear and decide on whether the parts are to be replaced or repaired		5	2	3
	PC15. assess taperness and ovality of cylinder bore		4	1	3
	PC16. inspect procedure of engine compression pressure, turbo charger, and exhaust gas recirculation systems		4	1	3
	PC17. check ovality of crank shaft/bearings		4	1	3
	PC18. measure the diameter of the piston rings and ring clearances		4	1	3
	PC19. measure and check the side clearance of piston rings		4	1	3
	PC20. check wear and tear in the valves		4	1	3
	PC21. check for the spring stiffness of the valves and clearance adjustment		4	1	3
	PC22. check for clearance between gear and oil pump body		4	1	3
	PC23. repair defective parts using hand tools, welding equipment, grinders, saws and other tools		4	1	3
	PC24. trouble shoot in case of any anomalies in engine parts		4	2	2
			100	**30**	**70**

4. AGR/N1129 Carry out overhauling and repair of transmission, hydraulic and tractor-electrical systems	PC1. dismantle and assemble the transmission system as per the manufacturer's recommendation and by using appropriate hand tools		3	1	2
	PC2. check and adjust the working & performance of clutch, gear box, rear axle, power take off, brakes and hydraulics system		3	1	2
	PC3. troubleshoot in case of any anomalies		2	1	1
	PC4. check free play setting of the clutch, finger height setting, alignment of clutch and plate		3	1	2
	PC5. check wear and tear of various parts of the clutch: — flywheel — clutch plate — pressure plate — clutch springs — clutch fingers — release bearings		3	1	2
	PC6. trouble shoot in case of any anomalies in clutch		2	1	1
	PC7. check the reasons for noisy gear,slipping of gear, oil leakage in gearbox		2	0.5	1.5
	PC8. dismantle and check the working and performance of the gear box		2	0.5	1.5
	PC9. check gear ratio, torque ratio, and types of gear used in gear box		2	0.5	1.5
	PC10. trouble shoot in case of any anomalies in Gear box		2	0.5	1.5
	PC11. check and adjust front wheel hub play		2	0.5	1.5
	PC12. check all nuts and bolts and their tightening		2	0.5	1.5
	PC13. adjust steering geometry (toe in, toe out, camber angle, caster angle and kingpin inclination) and carry out troubleshooting of steering system		3	1	2
	PC14. check the brake discs (dry and oil immersed), their working and maintenance and carry out troubleshooting including replacement of brake shoes and adjustment of free play		3	1	2
	PC15. ensure proper adjustment of brake and clutch and make sure the brakes and clutches free play are adjusted properly		2	0.5	1.5
	PC16. ensure that the brake paddle latch is engaged while driving on road		2	0.5	1.5

	PC17. carry out wheel track adjustment		2	0.5	1.5
	PC18. check the working and performance of the rear axle – differential, final reduction –bull & pinion ,epyclic (planetary reduction unit) and wheel assembly		3	1	2
	PC19. check Axle shaft,bearings oil seals and replace where necessary		2	0.5	1.5
	PC20. trouble shoot in case of any anomalies in rear axle		2	0.5	1.5
	PC21. check the steering system – in mechanical steering –steering box,linkages.in powersteering – steering motor (steering unit),steering cylinders & linkages		3	1	2
	PC22. trouble shoot in case of any anomalies in mechanical & power steering system		2	1	1
	PC23. dismantle & check the 2wd front axle –centere pin, stub axle & wheel assembly		3	1	2
	PC24. trouble shoot in case of any anamolies in 2wd front axle		2	0.5	1.5
	PC25. dismantle & check the 4 wd front axle –drop box,propeller shaft,differential,axle shaft & wheel assembly		2	0.5	1.5
	PC26. trouble shoot in case of any anamolies in 4wd front axle		2	1	1
	PC27. monitor the inflation pressure on the tyre as per the usage of the tractor		2	0.5	1.5
	PC28. check the tyres for any puncture and carry out refitting in that case		2	0.5	1.5
	PC29. dismantle the hydraulic system as per the manufacturer's recommendation and by using appropriate hand tools		2	0.5	1.5
	PC30. check and adjust the components and functioning of the hydraulic pump		2	0.5	1.5
	PC31. check the components of the hydraulic distributor and hydraulic cylinder and find faults if any		2	0.5	1.5
	PC32. check the components of the hydraulic pipes		2	0.5	1.5
	PC33. check and adjust the functioning of draft control and position control hydraulics		2	0.5	1.5
	PC34. check the quality of hydraulic oil and check important linkages		2	0.5	1.5
	PC35. check working and functioning of hydraulic system pressure and		2	0.5	1.5

	carry out troubleshooting				
	PC36. check the functioning of auxillary valve (for external hydraulics)		2	0.5	1.5
	PC37. check the lift mechanism (3 point linkage) of implements for tractors		2	0.5	1.5
	PC38. trouble shoot in case of any anomalies in hydraulics		2	0.5	1.5
	PC39. check the working and performance of battery		2	0.5	1.5
	PC40. check the functioning of different gauges in the instrument panel such as RPM guage, hour meter, fuel gauge, battery charging indicator, air filter choke indicator, etc		3	1	2
	PC41. monitor working and performance of alternator/dynamo and self starter		2	1	1
	PC42. check the working and performance of regulating system		2	0.5	1.5
	PC43. monitor the working and performance of starting system, relays and fuses		2	0.5	1.5
	PC44. check the working of headlights, brakelights and horns		2	0.5	1.5
	PC45. perform trouble shooting of tractor electrical parts when required		2	0.5	1.5
			100	**30**	**70**
5. AGR/N1130 Carry out assembly of repaired and serviced parts	PC1. carry out precise cleaning of fast moving parts/shafts and bearings		8	3	5
	PC2. carry out lubrication of parts where necessary		8	2	6
	PC3. follow the reverse sequence as in dismantling		8	2	6
	PC4. assemble parts in reverse sequence of dismantling		9	3	6
	PC5. set position of draft control levers		8	2	6
	PC6. adjust and pre load bearings of gear box		8	2	6
	PC7. fit cage wheel and adjust track		8	2	6
	PC8. check tyre pressure suitability for different operations		9	3	6
	PC9. ensure there is proper fuel bleeding before starting the tractor		9	3	6
	PC10. check for any leakages and tighten loose parts if any is detected		8	3	5
	PC11. start the engine and observe functioning for a certain period of time		8	2	6
	PC12. carry out troubleshooting in case any anomalies are detected		9	3	6

			100	30	70
6. AGR/N9903 Maintain health and safety at the workplace	PC1. undertake basic safety checks before operation of all machinery and vehicles and report all potential hazards to the supervisor		6	2	4
	PC2. identify work for which protective clothing or equipment is required and perform those duties in accordance with workplace policy		7	2	5
	PC3. read and understand the hazards of use and contamination mentioned on the labels of pesticides/fumigants, etc.		7	2	5
	PC4. assess risks prior to performing manual handling jobs, and work according to currently recommended safe practices		7	2	5
	PC5. use equipment and materials safely and correctly and return the same to designated storage when not in use		7	2	5
	PC6. dispose off waste safely and correctly in a designated area		6	2	4
	PC7. recognize risks to bystanders and take action to reduce risk associated with jobs in the workplace		7	2	5
	PC8. perform work in a manner which minimizes environmental damage all procedures and ensure work instructions for controlling risks are followed closely		7	2	5
	PC9. report any accidents, incidents or problems without delay to an appropriate person and take necessary immediate action to reduce further danger		7	2	5
	PC10. follow procedures for dealing with accidents, fires and emergencies, including communicating location and directions for emergency evacuation		7	2	5
	PC11. follow emergency procedures to company standard / workplace requirements		6	2	4
	PC12. use emergency equipment in accordance with manufacturers' specifications and workplace requirements		7	2	5
	PC13. provide treatment appropriate to the patient's injuries in accordance with recognized first aid techniques		7	2	5
	PC14. recover (if practical), clean, inspect/test, refurbish, replace and store the first aid equipment as appropriate		6	2	4
	PC15. report details of first aid administered		6	2	4

	in accordance with workplace procedures.				
			100	30	70
Total		600	600	180	420
Percentage Weightage:				30%	70%
Minimum Pass% to qualify (aggregate):				70%	