



Automotive Service Technician Level 5

QP Code: ASC/Q1403

Version: 1.0

NSQF Level: 5

Automotive Skills Development Council || 153, Gr Floor, Okhla Industrial Area, Phase - III, Leela Building
New Delhi - 110020

Qualification Pack

Contents

ASC/Q1403: Automotive Service Technician Level 5	3
<i>Brief Job Description</i>	3
Applicable National Occupational Standards (NOS)	3
<i>Compulsory NOS</i>	3
<i>Qualification Pack (QP) Parameters</i>	3
ASC/N0001: Plan and organise work to meet expected outcomes	5
ASC/N0002: Work effectively in a team	9
ASC/N0003: Maintain a healthy, safe and secure working environment	13
ASC/N1404: Carry out diagnosis of vehicle for repair requirements	17
ASC/N1405: Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle	25
ASC/N1406: Carry out service and repairs of electrical and electronic faults in a vehicle	34
Assessment Guidelines and Weightage	45
<i>Assessment Guidelines</i>	45
<i>Assessment Weightage</i>	45
Acronyms	47
Glossary	48

Qualification Pack

ASC/Q1403: Automotive Service Technician Level 5

Brief Job Description

An Auto Service Technician Level 5 is responsible for managing range of diagnosis and repairs with a wide range of specialised repair of mechanical, electrical and electronic faults.

Personal Attributes

An individual on this job must have good communication and interpersonal skills in addition to being a team player, as the job requires coordination with other technicians during diagnosis. The individual must have a technical bend of mind to understand the technical aspects related to various aggregates (including both mechanical & electrical) in a vehicle, which would also assist in the fault diagnosis in the vehicle. The individual should be proactive, process and customer centric with ability to guide junior technicians and strong sense to seek judgement from superiors in very complicated cases. Keeping oneself abreast of the latest developments and newer technologies used in the mechanical systems of engine aggregates is highly desirable.

Applicable National Occupational Standards (NOS)

Compulsory NOS:

1. [ASC/N0001: Plan and organise work to meet expected outcomes](#)
2. [ASC/N0002: Work effectively in a team](#)
3. [ASC/N0003: Maintain a healthy, safe and secure working environment](#)
4. [ASC/N1404: Carry out diagnosis of vehicle for repair requirements](#)
5. [ASC/N1405: Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle](#)
6. [ASC/N1406: Carry out service and repairs of electrical and electronic faults in a vehicle](#)

Qualification Pack (QP) Parameters

Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service and Repair
Country	India
NSQF Level	5

Qualification Pack

Aligned to NCO/ISCO/ISIC Code	NCO-2015/3115.0602
Minimum Educational Qualification & Experience	Diploma (Mechanical/Automobile Engineering) with 3-5 Years of experience For other qualifications
Minimum Level of Education for Training in School	
Pre-Requisite License or Training	On the job training: Desirable for ASDC Auto Service Technician Level 5 Certificate OR Bachelors in Mechanical/Electrical/Automobile Engineering Compulsory for all other qualifications
Minimum Job Entry Age	18 Years
Last Reviewed On	12/06/2013
Next Review Date	30/06/2020
Deactivation Date	30/06/2020
NSQC Approval Date	20/07/2015
Version	1.0

Qualification Pack

ASC/N0001: Plan and organise work to meet expected outcomes

Description

This NOS unit is about planning and organising an individuals work in order to complete it to the required standards on time.

Scope

This unit/task covers the following:

- work requirements including various activities, deliverables or work output required in the given time, maintain set quality standards
- appropriate use of resources (both material / equipment's and manpower)

Elements and Performance Criteria

Work requirements including various activities within the given time and set quality standards

To be competent, the user/individual on the job must be able to:

- PC1.** keep immediate work area clean and tidy
- PC2.** treat confidential information as per the organisations guidelines
- PC3.** work in line with organisations policies and procedures
- PC4.** work within the limits of job role
- PC5.** obtain guidance from appropriate people, where necessary
- PC6.** ensure work meets the agreed requirements

Appropriate use of resources

To be competent, the user/individual on the job must be able to:

- PC7.** establish and agree on work requirements with appropriate people
- PC8.** manage time, materials and cost effectively
- PC9.** use resources in a responsible manner

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the organisations policies, procedures and priorities for area of work, role and responsibilities in carrying out that work
- KU2.** the limits of responsibilities and when to involve others
- KU3.** specific work requirements and who these must be agreed with
- KU4.** the importance of having a tidy work area and how to do this
- KU5.** how to prioritize workload according to urgency and importance and the benefits of this
- KU6.** the organisations policies and procedures for dealing with confidential information and the importance of complying with these
- KU7.** the purpose of keeping others updated with the progress of work

Qualification Pack

- KU8.** who to obtain guidance from and the typical circumstances when this may be required
- KU9.** the purpose and value of being flexible and adapting work plans
- KU10.** how to complete tasks accurately by following standard procedures
- KU11.** technical resources needed for work and how to obtain and use these

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** write in at least one language
- GS2.** read instructions, guidelines/procedures
- GS3.** ask for clarification and advice from appropriate persons
- GS4.** communicate orally with colleagues
- GS5.** make a decision on a suitable course of action appropriate for accurately completing the task within resources
- GS6.** agree objectives and work requirements
- GS7.** plan and organise work to achieve targets and deadlines
- GS8.** deliver consistent and reliable service to customers
- GS9.** check own work and ensure it meets customer requirements
- GS10.** anomalies to the concerned persons
- GS11.** analyse problems and identify work-arounds taking help from
- GS12.** apply own judgement to identify solutions in different situations

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Work requirements including various activities within the given time and set quality standards</i>	16	47	-	-
PC1. keep immediate work area clean and tidy	2	9	-	-
PC2. treat confidential information as per the organisations guidelines	2	6	-	-
PC3. work in line with organisations policies and procedures	3	8	-	-
PC4. work within the limits of job role	3	6	-	-
PC5. obtain guidance from appropriate people, where necessary	3	7	-	-
PC6. ensure work meets the agreed requirements	3	11	-	-
<i>Appropriate use of resources</i>	9	28	-	-
PC7. establish and agree on work requirements with appropriate people	3	9	-	-
PC8. manage time, materials and cost effectively	3	11	-	-
PC9. use resources in a responsible manner	3	8	-	-
NOS Total	25	75	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0001
NOS Name	Plan and organise work to meet expected outcomes
Sector	Automotive
Sub-Sector	Manufacturing and R&D, Sales and Service, Road Transportation
Occupation	Auto Components /Aggregates Repair
NSQF Level	4
Credits	NA
Version	1.0
Last Reviewed Date	10/06/2013
Next Review Date	10/06/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

ASC/N0002: Work effectively in a team

Description

This NOS unit is about working effectively with colleagues, either in individuals own work group or in other work groups within organisation

Scope

This unit/task covers the following: Colleagues:

- Superiors
- Members of own work group
- People in other work groups within or outside the organisation Communicate:
- Face-to-face
- By telephone
- In writing

Elements and Performance Criteria

Effective communication

To be competent, the user/individual on the job must be able to:

- PC1.** maintain clear communication with colleagues
- PC2.** work with colleagues
- PC3.** pass on information to colleagues in line with organisational requirements
- PC4..** work in ways that show respect for colleagues
- PC5.** carry out commitments made to colleagues
- PC6.** let colleagues know in good time if cannot carry out commitments, explaining the reasons
- PC7.** identify problems in working with colleagues and take the initiative to solve these problems
- PC8.** follow the organisations policies and procedures for working with colleagues
- PC9.** ability to share resources with other members as per priority of tasks

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** the organisations policies and procedures for working with colleagues, role and responsibilities in relation to this
- KU2.** the importance of effective communication and establishing good working relationships with colleagues
- KU3.** different methods of communication and the circumstances in which it is appropriate to use these
- KU4.** benefits of developing productive working relationships with colleagues
- KU5.** the importance of creating an environment of trust and mutual respect
- KU6.** whether not meeting commitments, will have implications on individuals and the organisation

Qualification Pack

- KU7.** different types of information that colleagues might need and the importance of providing this information when it is required
- KU8.** the importance of problems, from colleagues perspective and how to provide support, where necessary, to resolve these

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** complete well written work with attention to detail
- GS2.** read instructions, guidelines/procedures
- GS3.** listen effectively and orally communicate information
- GS4.** make decisions on a suitable course of action or response
- GS5.** plan and organise work to achieve targets and deadlines
- GS6.** check that the work meets customer requirements
- GS7.** deliver consistent and reliable service to customers
- GS8.** apply problem solving approaches in different situations
- GS9.** apply balanced judgements to different situations
- GS10.** apply good attention to detail
- GS11.** check that the work is complete and free from errors
- GS12.** get work checked by peers
- GS13.** work effectively in a team environment

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Effective communication</i>	25	75	-	-
PC1. maintain clear communication with colleagues	4	10	-	-
PC2. work with colleagues	2	7	-	-
PC3. pass on information to colleagues in line with organisational requirements	3	8	-	-
PC4.. work in ways that show respect for colleagues	3	8	-	-
PC5. carry out commitments made to colleagues	2	8	-	-
PC6. let colleagues know in good time if cannot carry out commitments, explaining the reasons	2	8	-	-
PC7. identify problems in working with colleagues and take the initiative to solve these problems	4	9	-	-
PC8. follow the organisations policies and procedures for working with colleagues	3	9	-	-
PC9. ability to share resources with other members as per priority of tasks	2	8	-	-
NOS Total	25	75	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0002
NOS Name	Work effectively in a team
Sector	Automotive
Sub-Sector	Manufacturing and R&D, Sales and Service, Road Transportation
Occupation	Maintenance
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	23/09/2013
Next Review Date	30/09/2015
NSQC Clearance Date	28/09/2015

Qualification Pack

ASC/N0003: Maintain a healthy, safe and secure working environment

Description

This NOS unit is about monitoring the working environment and making sure it meets requirements for health, safety and security

Scope

This unit/task covers the following:

- Resources (both material & manpower) needed to maintain a safe working environment as per the prevalent norms & government policies including emergency procedures for illness, accidents, fires or any other reason which may involve evacuation of the premises

Elements and Performance Criteria

Resources needed to maintain a safe, secure working environment

To be competent, the user/individual on the job must be able to:

- PC1.** comply with organisations current health, safety and security policies and procedures
- PC2.** report any identified breaches in health, safety, and security policies and procedures to the designated person
- PC3..** Coordinate with other resources at the workplace to achieve the healthy, safe and secure environment for all incorporating all government norms esp. for emergency situations like fires, earthquakes etc.
- PC4.** identify and correct any hazards like illness, accidents, fires or any other natural calamity safely and within the limits of individuals authority
- PC5.** report any hazards outside the individuals authority to the relevant person in line with organisational procedures and warn other people who may be affected
- PC6.** follow organisations emergency procedures for accidents, fires or any other natural calamity
- PC7.** identify and recommend opportunities for improving health, safety, and security to the designated person
- PC8.** complete all health and safety records are updates and procedures well defined

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** legislative requirements and organisations procedures for health, safety and security and individuals role and responsibilities in relation to this
- KU2.** what is meant by a hazard, including the different types of health and safety hazards that can be found in the workplace
- KU3.** how and when to report hazards
- KU4.** the limits of responsibility for dealing with hazards

Qualification Pack

- KU5.** the organisations emergency procedures for different emergency situations and the importance of following these
- KU6.** the importance of maintaining high standards of health, safety and security
- KU7.** implications that any non-compliance with health, safety and security may have on individuals and the organisation
- KU8.** different types of breaches in health, safety and security and how and when to report these
- KU9.** evacuation procedures for workers and visitors
- KU10.** how to summon medical assistance and the emergency services, where necessary
- KU11.** how to use the health, safety and accident reporting procedures and the importance of these

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** complete accurate, well written work with attention to detail
- GS2.** read instructions, guidelines/procedures/rules
- GS3.** listen and orally communicate information
- GS4.** make decisions on a suitable course of action or response
- GS5.** plan and organise work to achieve targets and deadlines
- GS6.** build and maintain positive and effective relationships with colleagues and customers
- GS7.** apply problem solving approaches in different situations
- GS8.** analyse data and activities
- GS9.** apply balanced judgements to different situations
- GS10.** apply good attention to detail
- GS11.** check that the work is complete and free from errors
- GS12.** get work checked by peers
- GS13.** work effectively in a team environment

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Resources needed to maintain a safe, secure working environment</i>	25	75	-	-
PC1. comply with organisations current health,safety and security policies and procedures	3	9	-	-
PC2. report any identified breaches in health,safety, and security policies and procedures to the designated person	3	10	-	-
PC3.. Coordinate with other resources at the workplace to achieve the healthy, safe and secure environment for all incorporating all government norms esp. for emergency situations like fires,earthquakes etc.	3	10	-	-
PC4. identify and correct any hazards like illness, accidents, fires or any other natural calamity safely and within the limits of individuals authority	5	10	-	-
PC5. report any hazards outside the individuals authority to the relevant person in line with organisational procedures and warn other people who may be affected	3	9	-	-
PC6. follow organisations emergency procedures for accidents, fires or any other natural calamity	3	10	-	-
PC7. identify and recommend opportunities for improving health,safety, and security to the designated person	3	8	-	-
PC8. complete all health and safety records are updates and procedures well defined	2	9	-	-
NOS Total	25	75	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N0003
NOS Name	Maintain a healthy, safe and secure working environment
Sector	Automotive
Sub-Sector	Manufacturing and R&D, Sales and Service, Road Transportation
Occupation	Auto Components/Aggregates Repair
NSQF Level	4
Credits	NA
Version	1.0
Last Reviewed Date	10/06/2013
Next Review Date	10/06/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

ASC/N1404: Carry out diagnosis of vehicle for repair requirements

Description

This NOS unit is about troubleshooting problems and fault diagnosis of the vehicle (including both mechanical and electrical aggregates)

Scope

This unit/task covers the following:

- identify the fault responsible for vehicle trouble
- diagnosis of the operational faults to identify the root cause of the trouble
- take necessary action post the root cause analysis to repair the vehicle

Elements and Performance Criteria

Carry the diagnosis of the vehicle identify the root cause of the trouble

To be competent, the user/individual on the job must be able to:

- PC1.** . understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle
- PC2..** understand the functioning of each system, component and aggregate (including both mechanical and electrical aggregates) of a vehicle
- PC3.** . follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshoot problem in a vehicle
- PC4.** . obtain sufficient information from customer/ service advisor to make an assessment of service and repair needs of the vehicle
- PC5..** review the job card and understand customer complaints
- PC6.** . follow standard operating procedure set out for diagnosing faults (in case of complex faults take the assistance of the senior diagnosis technician/ technical manager)
- PC7.** . use checklists and standard OEM operating procedures to understand if the fault is because of improper servicing, or low levels of oils, coolants, grease etc. or poor quality oil/ air filters etc.
- PC8..** conduct inspection of the engine and aggregates to diagnose need for repairs or adjustment in various engine aggregates
- PC9.** . conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement
- PC10..** dismantle and reassemble aggregates of a vehicle (with help from other technicians and helper)
- PC11.** . conduct routine and non-routine inspections for pre-purchase assessment, vehicle fitness assessment, emission testing, safety assessment, post-accident diagnostic assessment, post-repair serviceability assessment and manufacturer recall assessment
- PC12..** compare results of diagnostic inspections and tests against vehicle specifications and any regulatory requirements
- PC13.** . finalise the list all the service, repair and replacement requirements of the vehicle post the diagnosis in consultation with service advisor/ supervisor

Qualification Pack

- PC14.** . follow standard operating procedures for using workshop tools and equipment
- PC15.** . ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary
- PC16..** ensure any malfunctions observed in tools and equipment are reported to the concerned persons
- PC17..** understand the various precautions to be taken to avoid damage to the vehicle and its components while working on diagnosis or troubleshooting the vehicle for any faults
- PC18..** request assistance from a superior when required(esp. in cases where the complex diagnosis needs to be done and is out of scope)
- PC19..** assist junior technicians in their work
- PC20.** . ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)
- PC21.** . drive a relevant 2/3/4 wheeler vehicle which is an important part of the diagnosis of the type of vehicle that is dealt by the relevant OEM

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** standard operating procedures of the organisation/ dealership for inspection and diagnosis of faults in a vehicle as prescribed by the OEM/ components manufacturer
- KU2.** standard operating procedures recommended by the dealership/ suppliers/OEM for using tools and equipment for diagnosis or troubleshooting of various aggregates
- KU3.** safety requirements for equipment and components during the diagnosis or troubleshooting the various aggregates for root cause analysis of the fault
- KU4.** documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer for the diagnosis of troubleshooting the vehicle for faults
- KU5.** organisational and professional code of ethics and standards of practice
- KU6.** safety, health, environmental policies and regulations for the workplace as well as for automotive trade in general (e.g. safe practices while working in pits/ under vehicles)
- KU7.** the basic technology used in and functioning of various components and aggregates of the vehicle including: engines and fuel system (diesel, petrol, electrical, gas, hybrid etc.) cooling system air supply systems emission and exhaust system ignition systems clutch assembly clutch operating system gearbox (manual and automatic) drivelines and hubs drive-train assembly and transmission systems (manual, automatic etc.) steering system suspension system brake system (including regenerative braking systems) tyres and wheels (including wheel alignment) radiator batteries and power storage system power-generating systems (including charging systems especially forelectrical and hybrid vehicles) electrical wire harness, lighting, ignition, electronic and air-conditioningsystems etc. energy recuperation systems, if applicable (e.g. in electric, gas and hybridvehicles) electronic systems including active and passive safety, media, comfort andconvenience, supplementary restraint systems (SRS), networking and othersystems electronic control unit hydraulic and pneumatic system various lubrication systems

Qualification Pack

- KU8.** the tools used to assess and confirm technical faults that cannot be determined through a visual inspection, including use of: organic light emitting displays anti-lock braking system abs/air bag scan tools, automotive scanners, graphing scanners, modular diagnostic information systems pressure indicators: fuel pressure testers, manifold gauge sets, oil pressure gauges, tire pressure gauges measuring equipment: vernier calipers, micrometer, feeler gauges, multimeter, flow metre, temp gauge, dial gauge etc. electrical and electronic testing equipment: volt meters, ammeters, ohmmeters, battery testing equipment, dedicated and computer based diagnostic equipment, oscilloscopes etc. other tools: laptops
- KU9.** the various sources of information available for assessing service and repair requirements of the vehicle including: diagnostic displays visual inspections test drives vehicle/equipment manufacturer specifications standard operating procedures for diagnosis
- KU10.** typical symptoms of common technical faults in a vehicle including fluid levels, leaks, wear and tear, damage to a part/ aggregate and need for adjustments (e.g . HEOC- High Engine Oil Consumption, oil leakage, tyre wear etc.)
- KU11.** the various values and tolerance limits of various components across the mechanical/ electrical aggregates (e.g. within the engine assembly the following sub-aggregates : bore diameter, Liner fitment, piston height and buttclearance of piston rings, permissible imbalance in crankshaft (main and BEjournal), axial and radial play in the camshaft etc.)
- KU12.** basic computer skills including the following: OEM specific computer applications basic computer based tasks (e.g. use of productivity tools such as word, excel etc.) basic internet based tasks (e.g. accessing and responding to emails etc.)

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** create documentation required on the job (including diagnosis cards, work sheets, etc.) regarding the basic diagnosis and of various fault identification tests performed using various equipment as per the OEM/ auto component and aggregate guidelines
- GS2.** complete and maintain workplace records on inspection, diagnosis and repair activities
- GS3.** record all diagnostic inspections and tests carried out on a vehicle
- GS4.** write any additional work to be done (on the job card) basis the diagnosis of the vehicle (in major mechanical & electrical aggregates) and convey it to the service advisors and other technicians to carry out the work
- GS5.** write in at least one language
- GS6.** read and interpret workplace related documentation including job cards, safety instructions, OEM guidelines etc. from supervisors and the service advisor basis the information conveyed by the customer on the issue/ fault faced
- GS7.** read various sources of information available for vehicle diagnosis including service manual and diagnostic and visual displays put up in the workshop
- GS8.** read the technical brochures, new service schedules, service bulletins (refresher and new) released by the OEM/ auto components manufacturer related to diagnosis of the various faults across vehicle aggregates
- GS9.** read policies and regulations pertinent to the job, including OEM guidelines, health and safety instructions etc.
- GS10.** clearly communicate workplace information and ideas with workplace colleagues (verbal and non-verbal)

Qualification Pack

- GS11.** use terms, names, grades, and other nomenclature pertaining to the automotive trade, tools, specific workshop equipment etc.
- GS12.** communicate with colleagues to handle verbal enquiries, such as clarifying indicated faults and problems indicated on a job card which would lead to the proper diagnosis of the issue to do an effective root cause analysis
- GS13.** communicate to the juniors technicians on the changes in technical brochures, new service schedules, service bulletins (refresher and new) released by the OEM/ auto components manufacturer related to diagnosis of the various faults across vehicle aggregates
- GS14.** communicate to the customer through the service advisor, the results of the test performed and appropriate values to find the root cause of the problem (e.g. in case of HEOC High Engine Oil Consumption issue, post the dismantled engine convey the appropriate condition of piston ring, crank shaft and cylinder block etc.)
- GS15.** analyse information and evaluate results to choose the best solution and solve problems
- GS16.** decide on the repair/ replacement of any aggregate (including those in the electrical and mechanical sub- assemblies) post the diagnosis (with help from a superior technical manager in case of complex diagnosis)
- GS17.** judge when to ask for help from a superior
- GS18.** plan work according to the required schedule and location
- GS19.** organize schedule to complete diagnosis on the vehicle so that repair/ replacement of aggregates/ components post diagnosis can start and vehicle can be delivered in a timely and cost effective manner
- GS20.** organise the workplace and work according to the principles of 5S
- GS21.** interpret the needs of customers understanding the key issue plaguing the poor performance of the vehicle and doing a proper diagnosis consulting the service advisor to minimise the repeat complaints
- GS22.** ensure that the service provided is of the highest order to ensure customer satisfaction
- GS23.** follow up with the Service Advisor on any unfavourable feedback received from customer on the complaints reported on the vehicle
- GS24.** recognise a workplace problem or a potential problem and take action prior to diagnosis (e.g. during diagnosis of the engine, ensure that engine aggregates are placed in proper place so that it doesn't cause any hindrance to other vehicles parked near the vehicle which is being diagnosed)
- GS25.** determine problems needing priority action
- GS26.** refer complex diagnosis outside area of responsibility to superior
- GS27.** analyse the complexity of work to determine if it can be successfully carried out (e.g. refer a vehicle to a superior in case of complex diagnosis for any fault which has not occurred before)
- GS28.** analyse the different components for the tolerance values post the diagnosis to understand the root cause of the issue
- GS29.** analyse, evaluate and apply the information gathered from observation, experience, reasoning, or communication to act efficiently
- GS30.** use the diagnosis results to take an appropriate decision on repair/ replacement of an aggregates (including mechanical and electrical subassemblies) in consultation with the supervisor/ service advisor

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Carry the diagnosis of the vehicle identify the root cause of the trouble</i>	30	70	-	-
PC1. . understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle	2	3	-	-
PC2.. understand the functioning of each system, component and aggregate (including both mechanical and electrical aggregates) of a vehicle	2	3	-	-
PC3. . follow standard operating procedures for using workshop tools and equipment for fault diagnosis or troubleshoot problem in a vehicle	1	2	-	-
PC4. . obtain sufficient information from customer/ service advisor to make an assessment of service and repair needs of the vehicle	1	2	-	-
PC5.. review the job card and understand customer complaints	1	2	-	-
PC6. . follow standard operating procedure set out for diagnosing faults (in case of complex faults take the assistance of the senior diagnosis technician/ technical manager)	1	2	-	-
PC7. . use checklists and standard OEM operating procedures to understand if the fault is because of improper servicing, or low levels of oils, coolants, grease etc. or poor quality oil/ air filters etc.	1	3	-	-
PC8.. conduct inspection of the engine and aggregates to diagnose need for repairs or adjustment in various engine aggregates	3	5	-	-
PC9. . conduct inspection of mechanical, electrical and electronic systems to diagnose need for repairs, adjustment or part replacement	3	6	-	-
PC10.. dismantle and reassemble aggregates of a vehicle (with help from other technicians and helper)	1	5	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC11. . conduct routine and non-routine inspections for pre-purchase assessment, vehicle fitness assessment, emission testing, safety assessment, post-accident diagnostic assessment, post-repair serviceability assessment and manufacturer recall assessment	3	6	-	-
PC12.. compare results of diagnostic inspections and tests against vehicle specifications and any regulatory requirements	2	6	-	-
PC13. . finalise the list all the service, repair and replacement requirements of the vehicle post the diagnosis in consultation with service advisor/ supervisor	1	5	-	-
PC14. . follow standard operating procedures for using workshop tools and equipment	1	3	-	-
PC15. . ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary	1	3	-	-
PC16.. ensure any malfunctions observed in tools and equipment are reported to the concerned persons	1	2	-	-
PC17.. understand the various precautions to be taken to avoid damage to the vehicle and its components while working on diagnosis or troubleshooting the vehicle for any faults	1	4	-	-
PC18.. request assistance from a superior when required(esp. in cases where the complex diagnosis needs to be done and is out of scope)	1	2	-	-
PC19.. assist junior technicians in their work	1	2	-	-
PC20. . ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)	1	2	-	-
PC21. . drive a relevant 2/3/4 wheeler vehicle which is an important part of the diagnosis of the type of vehicle that is dealt by the relevant OEM	1	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
NOS Total	30	70	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1404
NOS Name	Carry out diagnosis of vehicle for repair requirements
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	12/06/2013
Next Review Date	12/06/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

ASC/N1405: Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle

Description

This NOS unit is about an individual carrying out repairs and overhauling of mechanical systems of a vehicle.

Scope

This unit/task covers the following:

- servicing and major repairs of a mechanical aggregates in a vehicle
- repair and overhauling of engine and its related aggregates
- repair and overhauling of other mechanical aggregates and systems

Elements and Performance Criteria

Service and major repairs in mechanical aggregates

To be competent, the user/individual on the job must be able to:

- PC1..** understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gear box, transmission systems like propeller shaft etc.)
- PC2. .** follow standard operating procedures for using workshop tools and equipment for service and repairs of various vehicle aggregates
- PC3..** review the job card and understand service and repair work to be carried out in the various aggregates(including overall of various aggregates like engine)
- PC4. .** ensure that the correct spare parts, lubricants, tools and other materials required have been obtained
- PC5..** service, repair and overhaul: engines and fuel system (diesel, petrol, electrical, CNG, LPG etc.) cooling system radiator emission and exhaust system brake system clutch assembly gearbox, drive-train assembly and transmission systems (manual, automatic etc.) steering system suspension system tyres and wheels hydraulic and pneumatic system various lubrication systems
- PC6. .** conduct routine and non-routine inspections for vehicle fitness assessment, emission testing, safety assessment and post-repair serviceability assessment
- PC7. .** dismantle, assess, repair, clean, replace, adjust and reassemble the vehicle mechanical aggregates/ components
- PC8. .** identify and change vehicle components requiring change due to continuous wear and tear(including oil and air filters in the engine aggregate)
- PC9. .** ensure all dismantled components and aggregates are cleaned and conditioned prior to reassembly
- PC10..** carry out service, repair and overhauling activities safely to ensure: no damage to the vehicle or other vehicles no damage to vehicle components and systems no contact with hazardous materials

Qualification Pack

- PC11..** ensure disposal of materials (including waste oil, scrap of failed parts/ aggregates)in accordance with the organisations policies
- PC12. .** ensure, in consultation with the service advisor, approval of the customer on all repairs carried out
- PC13. .** record all service and repairs carried out and ensure completeness of tasks assigned before releasing vehicle for the next procedure
- PC14. .** ensure any other repair requirements observed in the other components/ aggregates systems (like engine, gear box etc.) while repairing/ overhauling of braking systems are communicated to service advisor
- PC15. .** follow standard operating procedures for using workshop tools and equipment
- PC16. .** ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary
- PC17. .** ensure any malfunctions observed in tools and equipment are reported to the concerned persons
- PC18..** inform the relevant persons where repairs/ overhauling of the aggregates are economically or technically infeasible
- PC19. .** request assistance from a senior technician when required
- PC20. .** assist junior technicians in their work
- PC21. .** ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** standard operating procedures for servicing, repair and replacement of parts in various aggregates of the vehicle
- KU2.** standard schedules and checklists recommended by the OEM for servicing and repair of various components and aggregates in the vehicle
- KU3.** safety requirements for equipment and components prescribed by the OEM (e.g. preventing/ dealing with oil spillage and inflammable materials)
- KU4.** identification codes, nomenclature of various components and aggregates
- KU5.** correct and appropriate grade of engine oil, coolant or lubricant grease to be used for the corresponding engine and other aggregates as specified by the OEM and auto component manufacturer
- KU6.** standard operating procedures recommended by the dealership/ suppliers/ OEM for using tools and equipment to be followed related to various aggregates and components in a vehicle as per the tool manufacturer instructions
- KU7.** standard operating procedures for rectification of errors in information (e.g. rectification of job card, reissue of correct tools and equipment etc.)
- KU8.** documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer
- KU9.** organisational and professional code of ethics and standards of practice
- KU10.** health and environmental policies and regulations for the workplace and automotive trade in general(e.g. safe working practices inside pits/ under vehicles)

Qualification Pack

- KU11.** regulatory requirements for vehicles including road safety, refrigerant handling, fuel storage and other requirements
- KU12.** operating specifications provided by the OEM for limits, fits and tolerances relating to engine mechanical, hydraulic and fluid systems for the vehicle
- KU13.** the basic technology used in and functioning of various components and aggregates of the vehicle including: engines and fuel system (diesel, petrol, electrical, gas etc.) radiator emission and exhaust system brake system clutch assembly gearbox, drive-train assembly and transmission systems (manual, automatic etc.) steering system suspension system electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc. electronic active and passive safety, media, comfort and convenience, supplementary restraint systems (SRS), networking and other systems electronic control unit tyres and wheels cooling system hydraulic and pneumatic system various lubrication systems
- KU14.** basic principles of: Ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction etc. vehicle earthing and earthing methods vehicle engine systems (e.g. types, applications and operation of sensors, actuators, etc.) types of circuit protection and their use electrical safety procedures the operation of warning, charging and starter circuits symbols, units and terms associated with electric systems and components battery charging electrical/electronic control systems operation of electronic and electric engine systems (including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fibre optics principles)
- KU15.** the tools used to assess and confirm technical faults that cannot be determined through a visual inspection, including use of: organic light emitting displays anti-lock braking system abs/air bag scan tools, automotive scanners, graphing scanners, modular diagnostic information systems pressure indicators: fuel pressure testers, manifold gauge sets, oil pressure gauges, tire pressure gauges pullers: ball joint separators, bearing pullers, gear puller tools, slide hammers specialty wrenches: alignment wrenches, chain wrenches, locking wrenches, lug wrenches trim or moulding tools: carbon scrapers, gasket scrapers, scrapers, spoons measuring equipment: vernier calipers, micrometer, feeler gauges, multimeter, flow metre, temp gauge, dial gauge etc. other tools: hand tools, power tools, lifting and jacking equipment, tensioning equipment, laptops, brake roller tester, chassis dynamometer, suspension activation, security activator etc. tools for other tasks such as cleaning of vehicles, tools, equipment and workshop
- KU16.** how to select the right materials for the job such as seals, sealants, fittings, gaskets, joints, fasteners etc.
- KU17.** how to carry out routine maintenance including: checking vehicle condition against OEM specifications to identify damage, corrosion, wear and tear, fluid levels, leaks and other problems in serviceability make adjustments to settings, alignment, pressures, tension, speeds and levels relevant to: - engine and aggregates (including fuel injection pump, ignition, intake and exhaust systems) - steering system - clutch and brake assembly - transmission system (including gearbox, differential, propeller shaft and axles) - other components (including tyres and body fittings)
- KU18.** the various sources of information available for assessing serviceability of the vehicle including: diagnostic displays visual inspections test drives vehicle/equipment manufacturer specifications standard operating procedures
- KU19.** how to repair and replace engine and its components including overhauling of the aggregates
- KU20.** how to dismantle, assess, repair, clean, condition, replace, adjust, reassemble and test mechanical components for correct operation

Qualification Pack

- KU21.** the method to correctly tag, seal and package checked engine components and aggregates
- KU22.** how to repair and replace engine and its components including overhauling of the aggregates
- KU23.** how to dispose of replaced components in accordance with safety, health and environmental policies and regulations
- KU24.** how to measure/ inspect the machining or any other repair done from an outside source/ local machining garages on the various aggregates (like machining of the piston, cylinder head, cylinder block in the engine aggregate)
- KU25.** how to carry out the full overhaul of the engines (with support from the other technicians and machine shops from local garages)
- KU26.** precautions to be taken to ensure the following while working (including specific precautions to be taken when working with alternative fuel/ hybrid vehicles): no damage to the vehicle or other vehicles no damage to vehicle components and systems no contact with hazardous materials

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** create documentation required on the job (including job cards, work sheets, etc.) regarding the basic details of repair , maintenance and service performed on the various aggregates (including engine and other aggregates overhauling)
- GS2.** complete and maintain workplace records on inspection, diagnosis and repair activities
- GS3.** write any additional requirement of work on the vehicle for service, maintenance or repair found during the work done as specified in the job card (e.g. while working on the engine overhauling, if the clutch/ pressure plate is worn off, then convey to the superiors and service advisor)
- GS4.** write in at least one language
- GS5.** read job cards and instructions from service advisor regarding the repair and service of various vehicle aggregates
- GS6.** read various sources of information available for assessing service and repair requirements of vehicle aggregates including service manual and diagnostic and visual displays put up in the workshop
- GS7.** read policies and regulations pertinent to the job, including OEM guidelines, health and safety instructions etc. while working on the vehicle aggregates
- GS8.** read the technical brochures, new service schedules, service bulletins (refresher and new) released by the OEM/ auto components manufacturer related to service and maintenance of various vehicle aggregates
- GS9.** clearly communicate workplace information and ideas with workplace colleagues(verbal & non-verbal)
- GS10.** use terms, names, grades, and other nomenclature pertaining to the automotive trade, tools, specific workshop equipment etc.
- GS11.** communicate with colleagues and customers to handle verbal enquiries, such as clarifying instructions on a job card and responding to requests for information
- GS12.** interact with the customer through service advisor/ supervisor in case any additional repair and service needs to be done on the vehicle aggregates

Qualification Pack

- GS13.** communicate to the juniors technicians on the changes in technical brochures, new service schedules, service bulletins (refresher and new) released by the OEM/ auto components manufacturer related to service and maintenance of various vehicle aggregates
- GS14.** analyse information and evaluate results to choose the best solution and solve problems
- GS15.** be proactive and creative in responding to workplace problems, changes and challenges
- GS16.** decide on the repair/ replacement of any engine aggregate post the diagnosis (with help from a technical manager in case required)
- GS17.** decide on whether the whole aggregate (gear box or engine overhaul) needs to be overhauled or some components/ parts needs to be changed
- GS18.** plan work according to the required schedule and location
- GS19.** plan the assigned aggregate repair work (including the specific engines or other aggregate that needs to be overhauled) on a daily basis and provide estimates of time required for each piece of work (e.g. by evaluating work assigned on a job card and providing time estimates for each service/ repair activity)
- GS20.** organise the workplace and work according to the principles of 5S
- GS21.** prioritise actions to achieve required outcomes
- GS22.** plan the assigned engine repair work (including the specific engines that needs to be overhauled) and provide estimates of time required for each engine overhaul repair
- GS23.** organise the schedule to complete work on the engine aggregate timely in case other aggregate repairs/ maintenance work is also required to be done
- GS24.** interpret the needs of customers by evaluating job cards and talking to Service Advisor and superiors
- GS25.** ensure that customer needs are assessed and satisfactory service is provided
- GS26.** follow up with the Service Advisor on any unfavourable feedback received from customer
- GS27.** recognise a workplace problem or a potential problem and take action
- GS28.** determine problems needing priority action
- GS29.** refer problems outside area of responsibility to appropriate person (e.g. unavailability of required spare parts or materials in the workshop)
- GS30.** gather information and provide assistance as required to solve problems
- GS31.** use a range of problem-solving techniques
- GS32.** create documentation required on the job (including job cards, work sheets, etc.) regarding the basic details of repair, maintenance and service performed on the various aggregates (including engine and other aggregates overhauling)
- GS33.** analyse the complexity of work to determine if they can successfully carry them out and if required, escalate to a superior
- GS34.** analyse, evaluate and apply the information gathered from observation, experience, reasoning, or communication to act efficiently

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Service and major repairs in mechanical aggregates</i>	30	70	-	-
PC1.. understand the auto component manufacturer specifications related to the various components/ aggregates in the vehicle (including major aggregates like engine. gear box, transmission systems like propeller shaft etc.)	2	3	-	-
PC2. . follow standard operating procedures for using workshop tools and equipment for service and repairs of various vehicle aggregates	1	3	-	-
PC3.. review the job card and understand service and repair work to be carried out in the various aggregates(including overall of various aggregates like engine)	1	3	-	-
PC4. . ensure that the correct spare parts, lubricants, tools and other materials required have been obtained	1	3	-	-
PC5.. service, repair and overhaul: engines and fuel system (diesel, petrol, electrical, CNG, LPG etc.) cooling system radiator emission and exhaust system brake system clutch assembly gearbox, drive-train assembly and transmission systems (manual, automatic etc.) steering system suspension system tyres and wheels hydraulic and pneumatic system various lubrication systems	3	6	-	-
PC6. . conduct routine and non-routine inspections for vehicle fitness assessment, emission testing, safety assessment and post-repair serviceability assessment	3	5	-	-
PC7. . dismantle, assess, repair, clean, replace, adjust and reassemble the vehicle mechanical aggregates/ components	2	5	-	-
PC8. . identify and change vehicle components requiring change due to continuous wear and tear(including oil and air filters in the engine aggregate)	3	5	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC9. . ensure all dismantled components and aggregates are cleaned and conditioned prior to reassembly	1	4	-	-
PC10.. carry out service, repair and overhauling activities safely to ensure: no damage to the vehicle or other vehicles no damage to vehicle components and systems no contact with hazardous materials	2	5	-	-
PC11.. ensure disposal of materials (including waste oil, scrap of failed parts/ aggregates)in accordance with the organisations policies	1	3	-	-
PC12. . ensure, in consultation with the service advisor, approval of the customer on all repairs carried out	1	3	-	-
PC13. . record all service and repairs carried out and ensure completeness of tasks assigned before releasing vehicle for the next procedure	1	3	-	-
PC14. . ensure any other repair requirements observed in the other components/ aggregates systems (like engine, gear box etc.) while repairing/ overhauling of braking systems are communicated to service advisor	1	3	-	-
PC15. . follow standard operating procedures for using workshop tools and equipment	1	3	-	-
PC16. . ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary	1	3	-	-
PC17. . ensure any malfunctions observed in tools and equipment are reported to the concerned persons	1	2	-	-
PC18.. inform the relevant persons where repairs/ overhauling of the aggregates are economically or technically infeasible	1	2	-	-
PC19. . request assistance from a senior technician when required	1	2	-	-
PC20. . assist junior technicians in their work	1	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC21. . ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)	1	2	-	-
NOS Total	30	70	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1405
NOS Name	Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	5
Credits	TBD
Version	1.0
Last Reviewed Date	12/06/2013
Next Review Date	12/06/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

ASC/N1406: Carry out service and repairs of electrical and electronic faults in a vehicle

Description

This NOS unit is about an individual carrying out service and repairs within the electrical and electronic systems of a vehicle.

Scope

This unit/task covers the following:

- identify the need for any repairs in the aggregates having any electrical or electronic sub-systems (including electronics within the engines, gear box etc.)
- repair electrical and electronic systems fault within the aggregate affecting the overall performance of the vehicle
- service any electrical/ electronic part within an aggregate

Elements and Performance Criteria

Service and repairs in electrical & electronic aggregates

To be competent, the user/individual on the job must be able to:

- PC1.** . understand the auto component manufacturer specifications related to the various electrical and electronic components and allied aggregates
- PC2..** follow standard operating procedures for using workshop tools and equipment for repair of electrical/ electronic components in a vehicle
- PC3.** . review the job card and understand work to be carried out in the electrical/ electronic aggregates as indicated by the supervisor or service advisor
- PC4.** . ensure that the correct spare parts tools and other materials required for service and repair of the electrical/ electronic components have been obtained

Qualification Pack

- PC5. .** repair and overhaul: stability/steering/ suspension systems (including electronic stability systems, vehicle dynamic control, closed loop electronic steering and multi-class Bus systems) electric over hydraulic systems (including garbage compactors, crane rams, steering control, excavator bucket control, steering rudder control etc.) engine management systems (including fuel cell technology/hydrogen, on line maintenance and remote diagnostics, common rail diesel direct injection, drive by wire, multi-class Bus systems and closed loop diesel engine management systems) transmission/driveline systems (including clutches, torque converters, mechanical and automatic transmissions, drive and power take-off shafts and differentials, mechatronic modules and multi-class Bus systems) braking systems (including ABS, engine brakes, electric retarders, electric trailer brakes, brake by wire and multi-class Bus systems) safety systems (including fire suppressing, work load detecting, tyre pressure control, speed/load limiting, traction control, seat belt pre-tensioning, roll over protection, object detection, navigation aids, intelligent transport systems, intelligent SRS systems, adaptive cruise control, multi-class Bus systems, active and passive collision avoidance, infrared vision, lighting and windscreen wipers control) monitoring/protection systems (including display types such as LCD, VFD, CRT, HUD, re-configurable systems, electronic analogue display, on board diagnostics, remote/wireless monitoring systems and multi-class Bus systems) convenience and entertainment systems (including audio and visual units, compact disks, analogue tapes, radio, speaker types, amplifiers, crossovers, balancers, aerials and multi-class Bus systems) theft deterrent systems (including remote keyless entry (RKE), immobiliser system design, passive entry systems, two way RKE, fingerprint technologies, rolling codes, transmitter and receiver operation, satellite systems) electric and hybrid vehicle systems (including battery technology, motor drive systems, motor controllers, air conditioning systems, electronic protection systems and multi-class Bus systems) climate control systems (including air conditioning, heating, blending systems and multi-class Bus systems) gearbox, drive-train assembly and transmission systems (manual, automatic etc.) electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc. electronic active and passive safety, media, comfort and convenience, supplementary restraint systems (SRS), networking and other systems electronic control unit hydraulic and pneumatic system
- PC6. .** PC6. repair all electrical and electronic faults including direct faults in: input sensors output actuators wiring harnesses computer systems calibration/adjustment specifications component specifications component assembly component damage system modifications
- PC7..** repair indirect faults caused on the major mechanical or other aggregates by the influence of electrical and electronic aggregate (e.g. influence of improper working on the ECU might have damaged the charging of the alternator
- PC8. .** remove, refit and test electrical components for normal operation following major/ minor body repair activities
- PC9..** dismantle, assess, repair, clean, replace, adjust and reassemble vehicle electric and electronic units
- PC10. .** ensure all dismantled components (other than the electrical or electronic components) are cleaned and conditioned prior to reassembly
- PC11. .** ensure disposal of materials (including scrap of failed parts/ aggregates) in accordance with the organisations policies
- PC12. .** understand the various precautions to be taken to avoid damage to other components/ aggregates of a vehicle while working on electrical/ electronic aggregates
- PC13. .** record all service and repairs carried out and ensure completeness of tasks assigned before releasing vehicle for the next procedure

Qualification Pack

- PC14.** . ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary
- PC15..** ensure any malfunctions observed in tools and equipment are reported to the concerned persons
- PC16.** . request assistance from a senior technician or aggregate specialist when required
- PC17.** . inform the relevant persons where repairs are economically or technically infeasible
- PC18..** ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)

Knowledge and Understanding (KU)

The individual on the job needs to know and understand:

- KU1.** standard operating procedures for servicing, repair and replacement of electrical/ electronic parts (including those related to various mechanical aggregates)
- KU2.** standard operating procedures recommended by the dealership/manufacturer/OEM for using tools and equipment for electrical/ electronic components
- KU3.** safety requirements for equipment within the tolerance limits used for service/ repair of electrical/ electronic components as prescribed by the OEM
- KU4.** identification codes, nomenclature of various electrical/ electronic components and aggregates
- KU5.** standard operating procedures for rectification of errors in information (e.g. rectification of job card, reissue of correct tools and equipment etc.)
- KU6.** documentation requirements for each procedure carried out as part of roles and responsibilities as specified by OEM/ auto component manufacturer
- KU7.** organisational and professional code of ethics and standards of practice
- KU8.** safety, health and environmental policies and regulations for the workplace as well as for automotive trade in general(e.g. safe working practices inside pits/ under vehicles)
- KU9.** regulatory requirements for vehicles including road safety, refrigerant handling, fuel storage and other requirements
- KU10.** operating specifications provided by the OEM for limits, fits and tolerances relating to engine electrical, electronic and hydraulic and fluid systems for the vehicle
- KU11.** the basic technology used in and functioning of various components and aggregates of the vehicle including: engines and fuel system (diesel, petrol, electrical, gas etc.) radiator emission and exhaust system brake system clutch assembly gearbox, drive-train assembly and transmission systems (manual, automatic etc.) steering system suspension system electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc. electronic active and passive safety, media, comfort and convenience, supplementary restraint systems (SRS), networking and other systems electronic control unit tyres and wheels cooling system hydraulic and pneumatic system various lubrication systems

Qualification Pack

- KU12.** basic principles of: ohms Law, voltage, power, current (AC/DC) resistance, magnetism, electromagnetism and electromagnetic induction etc. vehicle earthing and earthing methods vehicle engine systems (e.g. types, applications and operation of sensors, actuators, etc.) types of circuit protection and their use electrical safety procedures the operation of warning, charging and starter circuits symbols, units and terms associated with electric systems and components battery charging electrical/electronic control systems operation of electronic and electric engine systems (including electrical component function, electrical inputs, outputs, voltages and oscilloscope patterns, digital and fiber optics principles) electrical theory and operation covering automotive digital computers, networked vehicles, voltage, current, resistance, power, capacitance, electrostatics, magnetics, inductance, discrete electronic components, logic families, and radio frequency
- KU13.** the tools used to assess and confirm technical faults that cannot be determined through a visual inspection, including use of: organic light emitting displays anti-lock braking system abs/air bag scan tools, automotive scanners, graphing scanners, modular diagnostic information systems pressure indicators: fuel pressure testers, manifold gauge sets, oil pressure gauges, tire pressure gauges pullers: ball joint separators, bearing pullers, gear puller tools, slide hammers specialty wrenches: alignment wrenches, chain wrenches, locking wrenches, lug wrenches trim or moulding tools: carbon scrapers, gasket scrapers, scrapers, spoons measuring equipment: vernier calipers, micrometer, feeler gauges, flow metre, temp gauge, dial gauge, analogue and digital multi-meters, lab oscilloscopes, data scanners, test lights, test LEDs, pulse generators etc. electrical and electronic testing equipment: volt meters, ammeters, ohmmeters, battery testing equipment, dedicated and computer based diagnostic equipment, oscilloscopes etc. other tools: hand tools, power tools, lifting and jacking equipment, tensioning equipment, laptops, brake roller tester, chassis dynamometer, suspension activation, security activator etc. tools for other tasks such as cleaning of vehicles, tools, equipment and workshop
- KU14.** how to modify and repair electric and electronic systems to correct faults including: varying the performance of DC motors to meet changes in operational requirements varying the performance of alternators to meet changes in operational requirements changing the electrical sequenced operating order of electric over hydraulic systems converting vehicle from ground to insulated return external modification (not within the computer) to a digital computer management system that enhances the system performance(e.g. modification to an electronic engine management system, improving the performance of an ECU controlled engine cooling fan system that necessitates changes to relay circuitry) external modification (not within the computer) to a digital computer management system, utilizing electronic circuit design, development, manufacture, trial, evaluation, improvement, and commissioning, that enhances the system performance (e.g. development of an electronic control unit to delay engine crank whilst sounding an alarm warning of impending start of hazardous equipment) internal modification (within the computer) to a digital computer management system, utilizing electronic circuit design, reprogramming, development, manufacture, trial, evaluation, improvement, and commissioning that enhances the system performance (e.g. rectifying an original internal computer design/operating deficiency, disabling a function no longer required by customer etc.)
- KU15.** . the various sources of information available for assessing serviceability of the vehicle including: diagnostic displays visual inspections vehicle/equipment manufacturer specifications standard operating procedures
- KU16.** how to dismantle, assess, repair, clean, condition, replace, adjust and reassemble and test electronic and electric components for correct operation

Qualification Pack

- KU17.** the functioning of the vehicle battery and its schedule for change of water (as indicated by the battery manufacturer) and ensure that overcharging of the battery is avoided
- KU18.** how to dispose off replaced failed electrical/ electronic components in accordance with safety, health and environmental policies and regulations
- KU19.** precautions to be taken to ensure the following while working (including specific precautions to be taken when working with alternative fuel/ hybrid vehicles): no damage to the electrical / other advanced systems (in case of hybrid/ electrical vehicles) no damage to the vehicle on which work is being done along with other vehicles parked besides no damage to vehicle component sub-assemblies and other systems no contact with hazardous materials

Generic Skills (GS)

User/individual on the job needs to know how to:

- GS1.** create documentation required on the job (including job cards, work sheets, etc.) regarding the basic details of repair and maintenance done on the electrical/ electronic components
- GS2.** record all diagnostic performed on the electrical/ electronic components in vehicle
- GS3.** write in at least one language
- GS4.** write any additional requirement of work on the vehicle other than the one mentioned in the job card
- GS5.** read job cards and instructions from supervisors and the service advisor related to the work on the electrical/ electronic faults in a vehicle
- GS6.** read various sources of information available regarding the service and repair requirements of the electrical/ electronic sub-systems of the vehicle including service manual and diagnostic and visual displays put up in the workshop
- GS7.** read policies and regulations pertinent to the job, including OEM guidelines, health and safety instructions etc. related to work on the electrical/ electronic components and equipment
- GS8.** clearly communicate workplace information and ideas with colleagues(verbal & non-verbal)
- GS9.** use terms, names, grades and other nomenclature pertaining to the automotive trade, tools, specific workshop equipment etc.
- GS10.** communicate with colleagues and customers to handle verbal enquiries, such as clarifying instructions and responding to requests for information
- GS11.** interact with the customer through service advisor/ supervisor in case any additional work needs to be done related to the electrical/ electronic components which may not have been indicated in the job card
- GS12.** analyse information and evaluate results to choose the best solution and solve problems
- GS13.** decide on whether to repair or replace any electrical/ electronic aggregate post the diagnosis
- GS14.** judge when to ask for help from a colleague (Eq. regarding BS-3engine, taking help from an engine specialist to solve the electrical issues related to the engine electronics)
- GS15.** plan work according to the required schedule and location
- GS16.** organise the schedule to complete work on the vehicle timely in case other aggregate repairs/ maintenance work is also required to be done
- GS17.** interpret the needs of customers by evaluating job cards and talking to service advisor and superiors

Qualification Pack

- GS18.** ensure that the service provided is of the highest order to ensure higher levels of customer satisfaction
- GS19.** ensure timely communication of the additional requirements in a vehicle related to the electrical/ electronic components (including battery, headlight bulb change etc.) to the service advisor who in turn communicates it to the customer
- GS20.** follow up with the Service Advisor on any unfavourable feedback received from customer
- GS21.** recognise a workplace problem or a potential problem and take action (e.g. open wires while getting the battery charged)
- GS22.** determine problems needing priority action (e.g. any short circuit in any of the electrical circuit which may impact the performance of other aggregates esp. in a BS-3/ BS-4 vehicle which is entirely driven by electronic circuits)
- GS23.** refer problems outside area of responsibility to appropriate person (e.g. some defect in the ECU itself which would require special diagnosis by the senior technician/ supervisor)
- GS24.** gather information while working on electrical/ electronic aggregates and take appropriate action by consulting superiors (if needed)
- GS25.** assess repairs required based on technical faults identified as specified in the job card/ supervisor notes
- GS26.** refer complex problems (outside the current scope of work) to a superior in case any additional work requirement comes up
- GS27.** analyse, evaluate and apply the information gathered from observation, experience, reasoning, or communication to act efficiently
- GS28.** use the diagnosis results to take an appropriate decision on repair/ replacement of an electrical/ electronic aggregates

Qualification Pack

Assessment Criteria

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<i>Service and repairs in electrical & electronic aggregates</i>	25	75	-	-
PC1. . understand the auto component manufacturer specifications related to the various electrical and electronic components and allied aggregates	2	5	-	-
PC2. .. follow standard operating procedures for using workshop tools and equipment for repair of electrical/ electronic components in a vehicle	1	5	-	-
PC3. . review the job card and understand work to be carried out in the electrical/ electronic aggregates as indicated by the supervisor or service advisor	1	5	-	-
PC4. . ensure that the correct spare parts tools and other materials required for service and repair of the electrical/ electronic components have been obtained	2	5	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
<p>PC5. . repair and overhaul: stability/steering/ suspension systems (including electronic stability systems, vehicle dynamic control, closed loop electronic steering and multi-class Bus systems) electric over hydraulic systems (including garbage compactors, crane rams, steering control, excavator bucket control, steering rudder control etc.) engine management systems (including fuel cell technology/hydrogen, on line maintenance and remote diagnostics, common rail diesel direct injection, drive by wire, multi-class Bus systems and closed loop diesel engine management systems) transmission/driveline systems (including clutches, torque converters, mechanical and automatic transmissions, drive and power take-off shafts and differentials, mechatronic modules and multi-class Bus systems) braking systems (including ABS, engine brakes, electric retarders, electric trailer brakes, brake by wire and multi-class Bus systems) safety systems (including fire suppressing, work load detecting, tyre pressure control, speed/load limiting, traction control, seat belt pre-tensioning, roll over protection, object detection, navigation aids, intelligent transport systems, intelligent SRS systems, adaptive cruise control, multi-class Bus systems, active and passive collision avoidance, infrared vision, lighting and windscreen wipers control) monitoring/protection systems (including display types such as LCD, VFD, CRT, HUD, re-configurable systems, electronic analogue display, on board diagnostics, remote/wireless monitoring systems and multi-class Bus systems) convenience and entertainment systems (including audio and visual units, compact disks, analogue tapes, radio, speaker types, amplifiers, crossovers, balancers, aerials and multi-class Bus systems) theft deterrent systems (including remote keyless entry (RKE), immobiliser system design, passive entry systems, two way RKE, fingerprint technologies, rolling codes, transmitter and receiver operation, satellite systems) electric and hybrid vehicle systems (including battery technology, motor drive systems, motor controllers, air conditioning systems, electronic protection systems and multi-class Bus systems) climate control systems (including air conditioning, heating, blending systems and multi-class Bus systems) gearbox, drive-train assembly and transmission systems (manual, automatic etc.) electrical wire harness, lighting, ignition, electronic and air-conditioning systems etc. electronic active and passive safety, media, comfort and convenience, supplementary restraint systems (SRS), networking and other systems electronic control unit hydraulic and pneumatic system</p>	2	6	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC6. . PC6. repair all electrical and electronic faults including direct faults in: input sensors output actuators wiring harnesses computer systems calibration/adjustment specifications component specifications component assembly component damage system modifications	2	6	-	-
PC7.. repair indirect faults caused on the major mechanical or other aggregates by the influence of electrical and electronic aggregate (e.g. influence of improper working on the ECU might have damaged the charging of the alternator	2	6	-	-
PC8. . remove, refit and test electrical components for normal operation following major/ minor body repair activities	2	5	-	-
PC9.. dismantle, assess, repair, clean, replace, adjust and reassemble vehicle electric and electronic units	2	5	-	-
PC10. . ensure all dismantled components (other than the electrical or electronic components) are cleaned and conditioned prior to reassembly	1	4	-	-
PC11. . ensure disposal of materials (including scrap of failed parts/ aggregates) in accordance with the organisations policies	1	4	-	-
PC12. . understand the various precautions to be taken to avoid damage to other components/ aggregates of a vehicle while working on electrical/ electronic aggregates	1	3	-	-
PC13. . record all service and repairs carried out and ensure completeness of tasks assigned before releasing vehicle for the next procedure	1	3	-	-
PC14. . ensure all workshop tools, equipment and workstations are adequately maintained by carrying out scheduled checks, calibration and timely repairs where necessary	1	4	-	-
PC15.. ensure any malfunctions observed in tools and equipment are reported to the concerned persons	1	3	-	-
PC16. . request assistance from a senior technician or aggregate specialist when required	1	2	-	-
PC17. . inform the relevant persons where repairs are economically or technically infeasible	1	2	-	-

Qualification Pack

Assessment Criteria for Outcomes	Theory Marks	Practical Marks	Project Marks	Viva Marks
PC18.. ensure that trainings organized by the OEM from time-to-time are attended and knowledge levels are upgraded (esp. in case of newly launched products, product refreshes)	1	2	-	-
NOS Total	25	75	-	-

Qualification Pack

National Occupational Standards (NOS) Parameters

NOS Code	ASC/N1406
NOS Name	Carry out service and repairs of electrical and electronic faults in a vehicle
Sector	Automotive
Sub-Sector	Automotive Vehicle Service
Occupation	Technical Service & Repair
NSQF Level	4
Credits	TBD
Version	1.0
Last Reviewed Date	12/06/2013
Next Review Date	12/06/2015
NSQC Clearance Date	20/07/2015

Qualification Pack

Assessment Guidelines and Assessment Weightage

Assessment Guidelines

1. Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Element/ 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 Element/ PC.
2. The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3. Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS.
4. Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training center (as per assessment criteria below).
5. Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/ training center based on these criteria.
6. To pass the Qualification Pack assessment, every trainee should score the Recommended Pass % aggregate for the QP.
7. In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack.

Recommended Pass % : 75

Assessment Weightage

Compulsory NOS

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N0001.Plan and organise work to meet expected outcomes	25	75	-	-	100	10
ASC/N0002.Work effectively in a team	25	75	-	-	100	10
ASC/N0003.Maintain a healthy,safe and secure working environment	25	75	-	-	100	15

Qualification Pack

National Occupational Standards	Theory Marks	Practical Marks	Project Marks	Viva Marks	Total Marks	Weightage
ASC/N1404.Carry out diagnosis of vehicle for repair requirements	30	70	-	-	100	20
ASC/N1405.Carry out service and major repairs in mechanical aggregates and overhauling of a vehicle	30	70	-	-	100	25
ASC/N1406.Carry out service and repairs of electrical and electronic faults in a vehicle	25	75	-	-	100	20
Total	160	440	-	-	600	100

Qualification Pack

Acronyms

NOS	National Occupational Standard(s)
NSQF	National Skills Qualifications Framework
QP	Qualifications Pack
TVET	Technical and Vocational Education and Training

Qualification Pack

Glossary

Sector	Sector is a conglomeration of different business operations having similar business and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/ related set of functions in an industry.
Job role	Job role defines a unique set of functions that together form a unique employment opportunity in an organisation.
Occupational Standards (OS)	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the Knowledge and Understanding (KU) they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria (PC)	Performance Criteria (PC) are statements that together specify the standard of performance required when carrying out a task.
National Occupational Standards (NOS)	NOS are occupational standards which apply uniquely in the Indian context.
Qualifications Pack (QP)	QP comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A QP is assigned a unique qualifications pack code.
Unit Code	Unit code is a unique identifier for an Occupational Standard, which is denoted by an 'N'
Unit Title	Unit title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate OS they are looking for.
Scope	Scope is a set of statements specifying the range of variables that an individual may have to deal with in carrying out the function which have a critical impact on quality of performance required.

Qualification Pack

Knowledge and Understanding (KU)	Knowledge and Understanding (KU) are statements which together specify the technical, generic, professional and organisational specific knowledge that an individual needs in order to perform to the required standard.
Organisational Context	Organisational context includes the way the organisation is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills/ Generic Skills (GS)	Core skills or Generic Skills (GS) are a group of skills that are the key to learning and working in today's world. These skills are typically needed in any work environment in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.
Electives	Electives are NOS/set of NOS that are identified by the sector as contributive to specialization in a job role. There may be multiple electives within a QP for each specialized job role. Trainees must select at least one elective for the successful completion of a QP with Electives.
Options	Options are NOS/set of NOS that are identified by the sector as additional skills. There may be multiple options within a QP. It is not mandatory to select any of the options to complete a QP with Options.