# Sample Test Project

## District / Zonal Skill Competitions

### Skill- Automobile Technology

*Category: Transportation & Logistics*

# Table of Contents

# Section - A

## *A. Preface*

### Skill Explained:

Automobile Technology skill is related with servicing, diagnosis and repair of light motor vehicles, such as cars and utility vehicles. The trained and competent Light Vehicle Automobile Technician carries out servicing and repairs a range of light vehicles. The carry out diagnosis, repair and replacement, depending on the manufacturers' equipment, parts, materials, and procedures. The highly skilled Automobile Technician keeps abreast with continuous changes in the sector. The technicians is required to possess kinesthetic skills, and be versatile to take on the complex diagnostic tasks in advanced vehicles, and those incorporating the latest technologies.

**Eligibility Criteria (for IndiaSkills 2018 and WorldSkills 2019):**

Competitors born on or after 01 Jan 1997 are only eligible to attend the Competition.

### Total Duration: 3 Hrs

| | | |
|---|---|---|
| **Task A** | **:** | 90 Minutes |
| **Task B** | **:** | 90 Minutes |

# Section - B

## B. Test Project

### Task A – Electrical Fault Finding (Engine Management System & Body Electrical)

**Competitor Instruction Sheet**

You have **90 Minutes** to complete this task

Candidate should be able to diagnose and repair electrical faults pertaining to Engine Management System of the car. Candidate should also be able to diagnose and repair electrical faults pertaining to electrical systems in the car like- Lighting, Central Locking, and Power Windows etc. Candidate should be able to use Service Manual and Wiring Diagrams.

### Task B – Engine Mechanical

**Competitor Instruction Sheet**

You have **90 Minutes** to complete this task

Candidate should be able to perform mechanical tasks on engine (mounted on engine stand), including disassembly, measurements and assembly. Candidate should be able to use Service Manual, measuring instruments, general tools and special tools.

# Section – C

## C. Marking Scheme

**Marking Scheme:** The Assessment is done by awarding points by adopting two methods, Measurement and Judgments

- Measurement –One which is measurable
- Judgment-Based on Industry expectations

Aspects are criteria's which are judged for assessment.

**Final marking will be based on the outcomes, such as;**

- Candidate in position to operate productive equipment's.
- Candidate understand manual and circuit diagrams.
- Candidates have good knowledge of special tool and measuring instruments.
- Candidate is in position to diagnose the technical problem in car & engine and is able to rectify the problem in a qualitative manner.

**Assessment and Marking of Test Projects**

The maximum marks for each project will be 10 for District/Zonal level. The same will be allocated under the heads of Measurement and Judgment. For Judgement, marks will be awarded from 3 for each aspect as under**;**

• 0: performance below industry standard
• 1: performance meets industry standard
• 2: performance mostly meets industry standard and exceeds industry standards sometimes
• 3: excellent or outstanding performance

**Example-Judgment Marking**

If maximum marks for Judgement criteria is 1 and if all 3 Experts (Juries) give 3 points to a candidate, the candidate will get 1 mark for that aspect. If 2 Experts give 3 and 1 Expert gives 2 points, then candidate will get (3+3+2)/9*1 = 0.89 marks for that aspect out of 1 mark.

**Note:**
The Test Projects and Marking Scheme will be decided by the Experts (jury members) prior to competition, based on actual resources being used in the competition.

**The Marking Scheme of the mentioned Tasks is attached in Annexure - 1**

1. **TASK A–**Electrical Fault Finding (Engine Management System & Body Electrical)
2. **TASK B–**Engine Mechanical

# Section - D

## D. Infrastructure List

1. **Workshop Installation**-Tools & Equipment positioned by Organizers
2. **Tool Kit-**Tool & Equipment allowed to be brought by competitors for competitions

For Automobile Technology skill, all tools and equipment are provided by competition organizer- including safety PPEs. (Candidate should bring safety shoes).

**Summary of tools and equipment for 'Electrical Fault Finding' module:**

**Task A – Electrical Fault Finding**

**Equipment**

- Car Model:
- Digital Multimeter
- Manufacturers information
- Hand tools and equipment provided within the toolbox
- Scan tool- Diagnostic laptop

**Instructions**

- The engine will not start. You are required to start the vehicle.
- Front roof lamp and front fog lamps are not working. You are required to make these lamps operational.

**TASK B – Engine Mechanical**

**Equipment**

- Engine
- Manufacturers information
- Hand tools and equipment provided within the toolbox
- Special tools
- Torque Wrench, Micrometer screw gauge, Dial gauge and dial gauge stand

**Instructions**

- Dismantle the engine
- Perform the measurements. (Piston is provided separately for measurement)
- Complete Report Sheet

# Section – E

## E. Instructions for candidates

**The participating Competitors must ensure:**

- Perform all tasks by wearing proper Personnel Protective Clothing.
- Candidate must report on given time at the Competition Venue
- Candidate will not get any additional time for completing the task.
- Candidate can ask for any special tool if required.
- Candidates are not allowed to use any kind of unfair means during the test.
- All must follow the instruction given by examiner.
- No electronic devices like mobile, calculator permitted.
- Make sure all tools available are in proper condition before starting test.
- Candidates must be careful while handling tools and machines.
- Handle the fluids carefully like engine oil, coolant etc.

# Section – F

## F. Health, Safety, and Environment

1. All accredited participants, and supporting volunteers will abide by rules and regulations with regards to Health, Safety, and Environment of the Competition venue.

2. All participants, technicians and supporting staff will wear the required protective personnel clothing.

3. All participants will assume liability for all risks of injury and damage to property, loss of property, which might be associated with or result from participation in the event. The organizers will not be liable for any damage, however in case of Injury the competitor will immediately inform the immediate organizer for medical attention.

4. Competitors could lose marks or excluded from the competition (as per Competition Rules & Health and Safety documents) if they are identified working in an unsafe manner or create an unsafe workplace condition.

5. Working clothes must comply with relevant best practices in Automobile industry.

6. All machinery and/or equipment must comply with the mandatory safety requirements.

7. Competitors must keep their work area clear of obstacles and their floor area clear of any material, equipment or items likely to cause someone to trip, slip or fall;

8. All Competitors must wear PPE at all times in the workshop area;

9. Experts will use the appropriate personal protective equipment when inspecting, checking or working with a Competitor's project.

The following table shows the minimum regulations for skill-specific Health, Safety, and Environment Personal Protective Equipment that must be worn for the itemized tasks carried out in the workshop:

| TASK | TIGHT FITTING WORK UNIFORM (LONG TROUSERS) | SAFETY SHOES WITH PRTECTIVE CAP | STURDY SHOES WITH CLOSED TOE AND HEEL | HEARING PROTECTION | LATEX GLOVES |
|---|---|---|---|---|---|
| General PPE for safe areas | | | X | | |
| For all workstations | X | X | | | |
| Module E Transmission | X | X | | X | X |
| Module B Steering/Brakes | X | X | | X | X |

**Details of necessary protective clothing & Vehicle Protective Covers:**

The following table shows the list of items to be used for protection of vehicle and as PPE's

| **Vehicle Protective Cover** | **Personal Protective Equipment's** |
|---|---|
| Seat cover | Belt cover |
| Fender cover | Wrist watch cover |
| Steering wheel cover | Helmets |
| Gear lever cover | Goggles |
| | Hand gloves |
| | Aprons |
| | Ear plugs |

# Annexure – 1

**Skill Name:** Automobile Technology **Competitor Name:**_____

| Task | Criteria | Mark |
|---|---|---|
| A | Electrical Fault Finding (Engine management system & Body electrical) | 50.00 |
| B | Engine Mechanical | 50.00 |
| | **Grand Total** | 100.00 |

| Aspect Type M = Meas J = Judg | Aspect - Description | Judg Score | Extra Aspect Description (Meas or Judg) OR Judgement Score Description (Judg only) | Requirement or Nominal Size (Measurement Only) | Max Mark |
|---|---|---|---|---|---|
| | | | | | |
| J | Prepare and maintain a safe, tidy and efficient work station | | | | 5.00 |
| | | 0 | No preparation; No safety; no cleaning; | | |
| | | 1 | Check tools & equipment; minor damages; try to clean | | |
| | | 2 | Check tools & equipment; no damages; clean area | | |
| | | 3 | Check tools & equipment; very careful with equipment; clean everything, including tools | | |
| J | The competitor works in a safe manner | | | | 7.50 |
| | | 0 | The competitor doesn`t work safely. No boots, safety glasses, gloves etc | | |
| | | 1 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves throughout the time duration. | | |
| | | 2 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves all | | |

| | | | | | |
|---|---|---|---|---|---|
| | | | the time. They clean their workplace. | | |
| | | 3 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves all the time. They clean their workplace. No components are dropped. | | |
| | | | | | |
| M | VERIFIES THE COMPLAINT | | | | 1 |
| M | CHECKS THE BATTERY VOLTAGE | | | < 12 VOLTS | 1 |
| M | CONNECTS THE LAPTOP AND CHECKS FOR ANY DTC. | | | | 0.5 |
| M | CHECKS THE VOLTAGE SUPPLY AT PIN NO. 16 AT DIAGNOSTIC LINK CONNECTOR - DLC - USE OF WORKSHOP MANUAL | | | 12 VOLTS | 1 |
| M | CHECKS THE FUSE FOR DLC. FUSE NO. 6 IN CABIN FUSE BOX | | | < 1 Ω | 1 |
| M | REPLACES THE FUSE OF DLC. ( 5 AMP ) | | | | 1 |
| M | CHECKS THE GROUND CONNECTIVITY AT PIN NO. 4 AND 5 WITH EXTERNAL GROUND. | | | < 10 Ω | 1 |
| M | CONFIRMS THAT GROUND OF DLC IS DISCONNECTED | | | | 0.5 |
| M | FITS DLC GROUND CORRECTLY | | | | 1 |
| M | IDENTIFIES AND OPENS THE EMS ECU CONNECTOR ( V CONNECTOR - 96 PINS , M CONNECTOR - 58 PINS ) | | | M58 PINV-96PIN | 1 |
| M | CHECKS THE IGNITION SUPPLY(KEY ON)FOR EMS ECU AT EMS PIN V 23 ( IGNITION ON SIGNAL | | | 12 VOLTS | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| | NOT PRESENT AT PIN NO. V23 ) | | | | |
| M | CHECKS THE IGNITION SUPPLY FUSE NO. 11 IN ENG. FUSE BOX | | | | 1 |
| M | REPLACES THE IGNITION SUPPLY FUSE NO. 11 IN ENG. FUSE BOX | | | | 1 |
| M | CHECKS THE GROUND CONNECTIVITY AT EMS ECU PIN NO. V1/V2/ V3 | | | < 10 Ω | 1 |
| M | FINDS THAT EMS ECU GROUND IS NG | | | | 0.5 |
| M | CORRECTLY FITS THE EMS GROUND | | | | 0.5 |
| M | CONNECTS THE LAPTOP AND CHECKS FOR ANY DTC. | | | | 1 |
| M | CHECKS THE MAIN RELAY COIL CIRCUIT RESISTANCE -USE MULTIMETER | | | 50-150 Ω | 1 |
| M | REPLACES MAIN RELAY ( AFTER CHECKING THE COIL RESISTANCE ) | | | | 1 |
| M | CHECKS THE EMS RELAY FUSE NO. 7 IN ENG. FUSE BOX | | | < 1 Ω | 1 |
| M | REPLACES FUSE NO. 7 IN ENG. FUSE BOX | | | | 1.0 |
| M | STARTS THE ENGINE | | | | 1.0 |
| | | | | | |
| M | VERIFIES THE COMPLAINT | | | | 1.0 |
| M | USES WIRING DIAGRAM AND CHECKS THE FUSE FOR ROOF LAMP | | | < 1 Ω | 1.0 |
| M | REPLACES THE INTERIOR LAMP FUSE ( FUSE NO. 2 IN CABIN FUSE BOX) | | | | 1.0 |
| M | CHECKS DRIVER DOOR SWITCH. | | | | 1.0 |
| M | CONFIRMS DRIVER DOOR SWITCH IS OK | | | | 1.0 |

| | | | | | |
|---|---|---|---|---|---|
| M | CHECKS CONNECTOR OF DRIVER DOOR SWITCH | | | | 1.0 |
| M | CONCLUSION - DRIVER DOOR SWITCH CONNECTOR OPEN | | | | 1.0 |
| M | FIXES THE CONNECTOR OF DRIVER DOOR SWITCH PROPERLY | | | | 1.0 |
| M | CONFIRMS THAT ROOF LAMP IS NOW WORKING | | | | 1.0 |
| | | | | | |
| M | VERIFIES THE COMPLAINT BY OPERATING THE FRONT FOG LAMP | | | | 1.0 |
| M | CHECKS THE FUSE FOR FRONT FOG LAMP ( FUSE NO. 13 IN CABIN FUSE AND RELAY BOX ) | | | | 1.0 |
| M | REPLACES THE FRONT FOG LAMP FUSE | | | | 1.0 |
| M | AGAIN CHECKS THE FRONT FOG LAMP OPERATION | | | | 1.0 |
| M | DIAGNOSE THE FAULY FUSE NO. 14 BCM BAT. IN CABIN FUSE BOX | | | < 1 Ω | 0.5 |
| M | REPLACES THE FAULTY FUSE WITH CORRECT RATING | | | | 0.5 |
| M | CONFIRMS FOG LAMP IS STILL NOT WORKING | | | | 0.5 |
| M | CHECKS WIRE CONECTIVITY BETWEEN BCM PIN NO. 3H AND COMBINATION SWITCH RH STACK PIN NO. B4 - FOUND OK | | | < 1 Ω | 1.0 |
| M | FINDS WIRE OPEN | | | | 1.0 |
| M | CORRECTLY CONNECTS THE CONNECTION | | | | 1.0 |
| M | CONFIRMS FOG LAMP IS NOW WORKING | | | | 0.50 |
| | | | | | 50.00 |

| Aspect Type M = Meas J = Judg | Aspect - Description | Judg Score | Extra Aspect Description (Meas or Judg) OR Judgement Score Description (Judg only) | Requirement or Nominal Size (Measurement Only) | Max Mark |
|---|---|---|---|---|---|
| | | | | | |
| J | Prepare and maintain a safe, tidy and efficient work station | | | | 5.00 |
| | | 0 | No preparation; No safety; no cleaning; | | |
| | | 1 | Check tools & equipment; minor damages; try to clean | | |
| | | 2 | Check tools & equipment; no damages; clean area | | |
| | | 3 | Check tools & equipment; very careful with equipment; clean everything, including tools | | |
| J | The competitor works in a safe manner | | | | 5.00 |
| | | 0 | The competitor doesn`t work safely. No boots, safety glasses, gloves etc | | |
| | | 1 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves throughout the time duration. | | |
| | | 2 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves all the time. They clean their workplace. | | |
| | | 3 | The competitor works safely. Correct PPE, wears boots, safety glasses and gloves all the time. They clean their workplace. No components are dropped. | | |
| | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| M | REMOVES THE BOLTS (1A) AND REMOVES THE OIL FILTER GUARD (1B).REMOVES THE CONNECTORS (2A) AND REMOVES THE TURBOCHARGER ENGINE OIL SUPPLY PIPE (2B). | | | | 0.50 |
| M | REMOVES THE BOLTS (3) SECURING THE ENGINE OIL RETURN PIPE FROM THE TURBOCHARGER, CRANKCASE SIDE. | | | | 0.50 |
| M | REMOVES THE NUTS (4A) AND THE BOLT (4B) SECURING THE ENGINE LIFTING BRACKET AND REMOVES THE EXHAUST MANIFOLD HEAT SHIELD (4C). | | | | 0.50 |
| M | REMOVES THE NUTS (1A) AND REMOVES THE TURBOCHARGER (1B) COMPLETE WITH CATALYTIC CONVERTER (1C).COMPLETELY REMOVES THE FIXING BOLTS LOOSENED PREVIOUSLY AND REMOVES THE CRANKSHAFT PULLEY (3). | | | | 0.50 |
| M | REMOVES THE NUTS AND REMOVES THE COOLANT PUMP (4) COMPLETE WITH GASKET.REMOVES THE BOLTS (1A) AND REMOVES THE TIMING SIDE RIGID ENGINE SUPPORT (1B) COMPLETE WITH ENGINE LIFTING BRACKET (1C). | | | | 0.50 |
| M | COMPLETELY REMOVES THE LEFT HAND THREADED BOLT (1A) (LOOSENING IN CLOCKWISE DIRECTION) LOOSENED | | | | 0.50 |

| | | | | | |
|---|---|---|---|---|---|
| | PREVIOUSLY AND REMOVES THE PULLEY MOUNTING FLANGE ON THE CRANKSHAFT (1B). | | | | |
| M | REMOVES THE BOLTS (1A) AND REMOVES THE SUPPORT (1B).REMOVES THE NUTS (2A) AND THE BOLTS (2B) SECURING THE CRANKCASE SUMP. | | | | 0.50 |
| M | REMOVES THE CRANKCASE SUMP.REMOVES THE BOLTS (1A) AND REMOVES THE CRANKCASE OIL SUMP PARTITION (1B). | | | | 0.50 |
| M | REMOVES THE BOLTS (1A) AND REMOVES THE TIMING COVER (1B) COMPLETE WITH ENGINE OIL SUCTION DEVICE (1C) AND ENGINE OIL PUMP. | | | | 0.50 |
| M | REMOVES THE TIMING COVER GASKET | | | | 0.50 |
| M | KEEPS THE TOOL (1) PART NO 1871000900 (TEMPLATE) FITTED ON THE EXHAUST SIDE CAMSHAFT.FITS THE CAMSHAFT TIMING ADJUSTMENT TOOL (1) PART NO. 1870900300 (TEMPLATE).REMOVES THE TIMING DRIVEN PULLEY FIXING BOLT (1). | | | | 0.50 |
| M | MARKS THE POSITION OF THE TIMING DRIVEN PULLEY, THE TIMING DRIVE PULLEY AND THE TIMING DRIVE CHAIN (IF THE CHAIN REMOVED IS BEING REUSED); IF THE PULLEYS ARE REPLACED, FIT THEM WITH THE WRITING FACING OUTWARDS. | | | | 0.50 |

| | | | | | |
|---|---|---|---|---|---|
| M | REMOVES THE BOLTS (1A) AND REMOVES THE TIMING CHAIN FIXED PAD (1B).REMOVES THE PIN (2A) AND REMOVES THE TIMING CHAIN MOVING PLATE (2B). | | | | 0.50 |
| M | REMOVES THE TIMING DRIVEN PULLEY (3A) TOGETHER WITH THE CHAIN (3B) AND THE TIMING DRIVE PULLEY (1C). | | | | 0.50 |
| M | REMOVES THE BOLTS (1A) AND REMOVES THE MOBILE TIMING CHAIN TENSIONER (1B). | | | | 0.50 |
| M | UNSCREWS THE CONNECTORS (3A) AND REMOVES THE PIPE CONNECTING FUEL MANIFOLD TO INJECTORS (3B) | | | | 0.50 |
| M | USES NEW PIPES FROM THE FUEL MANIFOLD TO THE INJECTORS WHEN REFITTING, DO NOT REUSE IT. (IF COMPETITOR ASKS FOR NEW HP PIPES, GIVE FULL MARKS .IF COMPETITOR DOES NOT ASK FOR NEW HP PIPES, GIVE "0" MARKS.) | | | | 0.50 |
| M | LOOSENS THE BAND AND DISCONNECT THE PIPE (4A) FROM THE FUEL MANIFOLD (4B). | | | | 0.50 |
| M | REMOVES THE BOLTS (5A) AND REMOVES THE MOUNTING BRACKET (5B) COMPLETE WITH SINGLE FUEL MANIFOLD PIPE (5C), FUEL PRESSURE REGULATOR (5D) AND FUEL PRESSURE SENSOR (5E). | | | | 0.50 |

| | | | | | |
|---|---|---|---|---|---|
| M | REMOVES THE INJECTOR FASTENING BRACKET NUT (1). | | | | 0.50 |
| M | REMOVES THE INJECTORS (3A), ONE AT A TIME (NO NEED TO USE SPECIAL TOOL FOR INJECTOR REMOVAL. INJECTORS ARE ALREADY LOOSENED.) | | | | 0.50 |
| M | REMOVES THE INJECTORS COMPLETE WITH BRACKET. | | | | 0.50 |
| M | REMOVES THE BOLTS (1A) AND (1B) AND REMOVES THE CAMSHAFT HOUSING ASSEMBLY (1C).REMOVES THE SEAL (2).(METAL GASKET) | | | | 0.50 |
| M | LOOSENS THE COLLAR AND DISCONNECT THE CONDENSED ENGINE OIL RECOVERY PIPE (1), OIL VAPOUR SEPARATOR SIDE. | | | | 0.50 |
| M | REMOVES THE BOLTS (1A) AND REMOVES THE CYLINDER HEAD ASSEMBLY (1B). | | As per sequence | | 0.50 |
| M | REMOVES THE CYLINDER HEAD GASKET (2). | | | | 0.50 |
| M | REMOVES THE LOWER CRANKCASE RETAINING BOLTS | | | | 1.00 |
| M | REMOVES THE LOWER CRANKCASE | | | | 1 |
| | | | | | |
| M | MEASURES THE PISTON PROJECTION IN TWO PLACES AT 180° ON THE GUDGEON PIN AXIS USING THE TOOL (1) 1870404001 (DIAL GUAGE MOUNT) 1 AND | | 0.055-0.265mm | | 1 |
| M | USES CORRECT TOOL 1870404001 | | | | 1 |

| | | | | | |
|---|---|---|---|---|---|
| M | TAKE THE AVERAGE OF THE TWO VALUES MEASURED FOR EACH PISTON. | | | | 1 |
| M | SELECTS THE CORRECT SIZE CYLINDER HEAD GASKET, ACCORDING TO THE MAXIMUM VALUE OF THE AVERAGES FOR THE PROJECTION FOR EACH INDIVIDUAL PISTON. | | | | 1 |
| M | CHECKS THE PISTON SKIRT DIAMETER (MM) | | Grade A-69.520-69.530<br>Grade B-69.530-69.540<br>Grade C-69.540-69.550 | | 1 |
| M | CORRECTLY USES MICROMETER SCREW GAUGE | | | | 1 |
| M | CHECKS PISTON OD AT CORRECT LOCATION | | | | 1 |
| | | | | | |
| M | REFITS THE LOWER CRANKCASE(1) WITH LOWER MAIN BEARING HALVES IN ITS SEAT. | | | | 0.5 |
| M | TIGHTENS THE M10 CENTRAL BOLTS (2A) SECURING THE LOWER CRANKCASE TO THE SPECIFIED TORQUE ,FOLLOWING THE ORDER SHOWN IN THE FIG.USES THE ANGULAR TIGHTENING TOOL(2B) | | 1.9-2.1 kgm+80º+-3º | | 0.5 |
| M | TIGHTENS THE LOWER M8 CRANKCASE SIDE BOLTS TO A SPECIFIED TORQUE AS PER THE ORDER SHOWN IN FIGURE. | | 2.9-3.2 kgm | | 0.5 |
| M | FITS THE CRANKSHAFT TIMING TOOL(1) PART NO 1870900300 | | | | 1 |
| M | FITS THE LOWER CYLINDER HEAD CENTERING BUSHES ON THE ENGINE BLOCK | | | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| M | POSITIONS THE NEW CYLINDER HEAD GASKET ON CYLINDER BLOCK | | | | 0.5 |
| M | TIGHTENS THE CYLINDER HEAD BOLTS TO THE RECOMMENDED TORQUE USING ANGULAR TORQUE WRENTCH IN TWO STAGES | | 3.8-4.2 kgm +90º | | 1 |
| M | FOLLOWS THE TIGHTENING SEQUENCE SHOWN IN MANUAL | | | | 0.5 |
| M | CHECKS THE CYLINDER HEAD - CRANKCASE MISALIGNMENT | | max misalignment 0.1 mm | | 0.5 |
| M | CONNECTS THE CONDENSED ENGINE OIL RECOVERY PIPE ,VAPOOR SEPERATER SIDE AND TIGHTEN THE BAND | | | | 0.5 |
| M | PLACES THE CAMSHAFT HOUSING ALONG WITH THE CAMSHAFT LOCKED WITH CAMSHAFT LOCKING TOOLS | | | | 0.5 |
| M | TIGHTENES THE SINGLE CAMSHAFT HOUSING M8 FIXING BOLTS TO A PRE TORQUE OF 1.5 KGM AND M7 TO A PRE TORQUE OF 1.2 KGM | | | | 0.5 |
| M | TIGHTENS THE BOLTS (2A) TO A TORQUE OF 2.5 KGM AND (2B) TO A TORQUE OF 1.8 KGM SECURING THE SINGLE CAMSHAFT HOUSING AS PER SEQUENCE SHOWN IN MANUAL | | if sequence not followed or torque not given 0 marks | | 1 |
| M | REFITS THE INJECTORS WITH BRACKETS AND FOLLOWS THE NOTE GIVEN IN THE MANUAL | | 0 marks if note not followed and torque not given | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| M | FITS THE CHAIN TENSIONER AND TIGHTENS TO PROPER TORQUE | | 0.8-1 kgm | | 0.5 |
| M | REFITS THE EXHAUST SIDE CAMSHAFT TOOTHED DRIVE PULLEY TOGETHER WITH CHAIN AND TOOTHED DRIVE PULLEY . | | | | 0.5 |
| M | PLACES THE TIMING CHAIN MOVING PAD BACK IN ITS HOUSING AND SECURE IT USING THE PIN. | | | | 0.5 |
| M | PLACES THE TIMING CHAIN FIXED PAD BACK IN ITS HOUSING AND SECURE IT USING THE BOLTS. | | | | 0.5 |
| M | TIGHTENS THE BOLT FIXING THE EXHAUST SIDE CAMSHAFT TOOTHED PULLEY TO A TORQUE. 13.5 ~ 16.5 KG-M.REMOVES THE CHAIN TENSIONER RETAINING PIN AND CHECK THAT THE PISTON IS IN CONTACT WITH THE MOBILE PAD.REFITS THE SUPPORT BRACKET COMPLETE WITH SINGLE FUEL MANIFOLD PIPE, FUEL PRESSURE REGULATOR, FUEL PRESSURE SENSOR AND SECURE USING THE BOLTS. | | 13.5 ~ 16.5 Kg-m. | | 0.5 |
| M | FITS NEW PIPES FROM THE FUEL MANIFOLD TO THE INJECTORS AND SECURE WITH CONNECTORS WITHOUT TIGHTENING. | | | | 0.5 |
| M | TIGHTENS THE CONNECTORS FOR THE PIPES FROM THE FUEL MANIFOLD TO THE INJECTOR SIDE INJECTORS TO A TORQUE OF 2.3 ~ 2.5 | | 2.3 ~ 2.5 Kg-m | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| | KG-M USING AN APPROPRIATE COMMERCIAL WRENCH. | | | | |
| M | TIGHTENS THE CONNECTORS FOR THE PIPES FROM THE FUEL MANIFOLD TO THE FUEL MANIFOLD SIDE INJECTORS TO A TORQUE OF 2.6 ~ 2.9 KG-M USING AN APPROPRIATE COMMERCIAL WRENCH.PLACES A NEW PIPE FROM THE PRESSURE PUMP TO THE SINGLE FUEL MANIFOLD IN ITS HOUSING AND SECURE IT USING THE CONNECTORS WITHOUT TIGHTENING THEM. | | 2.6 ~ 2.9 Kg-m | | 0.5 |
| M | TIGHTENS THE M12 CONNECTOR FOR THE PIPE FROM THE PRESSURE PUMP TO THE SINGLE FUEL MANIFOLD, PUMP SIDE, TO A TORQUE OF 2.3 ~ 2.5 KG-M USING A SPANNER. | | 2.3 ~ 2.5 Kg-m | | 0.5 |
| M | TIGHTENS THE M14 CONNECTOR FOR THE PIPE FROM THE PRESSURE PUMP TO THE SINGLE FUEL MANIFOLD, FUEL MANIFOLD SIDE.CONNECTS THE FUEL OUTLET PIPE FROM THE INJECTORS, INJECTOR SIDE AND PUSH IN UNTIL THE CLIPS CLICK INTO PLACE.PLACES THE CAMSHAFT COVER GASKET BACK IN ITS HOUSING. | | | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| M | FITS THE TOOL (1) 1870900600 (HOSE) TO THE TIMING COVER.REFITS THE TIMING COVER (2A) COMPLETE WITH ENGINE OIL SUCTION DEVICE (2B) AND ENGINE OIL PUMP. | | | | 0.5 |
| M | TIGHTENS THE M6 BOLTS (1A) TO A TORQUE OF 0.8 ~ 1.0 KG-M AND THE M6 NUTS (1B) TO A TORQUE OF 0.8 ~ 1.0 KG-M SECURING THE TIMING COVER TO THE SPECIFIED TORQUE. FOLLOW THE PROPER SEQUENCE SHOWN IN MANUAL | | 0.8 ~ 1.0 Kg-m | | 0.5 |
| M | PLACES THE DAMPER PULLEY ALONG WITH THE LEFTHAND CRANKSHAFT BOLT IN ITS PLACE AND TIGHTENS THE BOLT TO SPECIFIED TORQUE ROTATING THE BOLT IN ANTICLOCKWISE DIRECTION.CONNECTS THE ENGINE OIL VAPOUR RECIRCULATION PIPE FITTING TO THE TIMING COVER AND TIGHTEN THE BOLTS.PLACES THE CRANKCASE OIL SUMP PARTITION BACK IN ITS HOUSING AND SECURE IT USING THE BOLTS. | | 4.7-5.2+75º | | 0.5 |
| M | POSITIONS THE CRANKCASE SUMP (1A) IN ITS HOUSING AND SECURE IT TIGHTENING THE M6 BOLTS (1B) TO A TORQUE OF 0.8 ~ 1.0 KG-M AND THE M6 NUTS (1C) TO A TORQUE OF 0.8 ~ 1.0 | | 0.8 ~ 1.0 Kg-m | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| | KG-M. AND FOLLOWS THE ORDER | | | | |
| M | PLACES THE BRACKET (2A) IN ITS HOUSING AND SECURE IT BY TIGHTENING THE M8 BOLTS (2B) TO A TORQUE OF 2.7 ~ 3.3 KG-M. | | 2.7 ~ 3.3 Kg-m. | | 0.5 |
| M | PLACES THE TIMING SIDE RIGID ENGINE SUPPORT IN ITS HOUSING WITH THE ENGINE LIFT BRACKET AND SECURE IT TIGHTENING THE M10 BOLTS TO A TORQUE OF 5.7 ~ 6.3 KG-M . | | 5.7 ~ 6.3 Kg-m . | | 0.5 |
| M | PLACES THE WATER PUMP, COMPLETE WITH GASKET IN POSITION, AND THEN TIGHTEN THE M10 BOLTS TO A 0.8 ~ 1.0 KG-M TORQUE.PLACES THE TURBOCHARGER UNIT COMPLETE WITH CATALYTIC CONVERTER BACK IN ITS HOUSING AND SECURE IT BY TIGHTENING THE M8 NUTS TO A TORQUE OF 2.2 ~ 2.7 KG-M | | 0.8 ~ 1.0 Kg-m<br>2.2 ~ 2.7 Kg-m | | 0.5 |
| M | REFITS THE EXHAUST MANIFOLD HEAT SHIELD WITH THE ENGINE LIFT BRACKET AND SECURE WITH THE NUT AND BOLTS.POSITIONS THE PIPE CARRYING ENGINE OIL TO THE TURBOCHARGER IN ITS HOUSING AND SECURE IT TIGHTENING M10 CONNECTORS TO A TORQUE OF 1.3 ~ 1.6 KG-M. | | 1.3 ~ 1.6 Kg-m. | | 0.5 |

| | | | | | |
|---|---|---|---|---|---|
| M | POSITIONS A NEW GASKET BETWEEN THE CRANKCASE AND THE ENGINE OIL RETURN PIPE TO THE TURBOCHARGER.FITS THE PROTECTIVE STRIPS TO THE OIL FILTER AND THE ENGINE OIL HEAT EXCHANGER. | | | | 0.5 |

50.00