



Sample Test Project

Regional Skill Competitions – Level 3

Skill 33 - Automobile Technology

Category: Transportation & Logistics

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SAMPLE

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 technician 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.

Standard Specifications:

- Work organization and management
- Communication and interpersonal skills
- Electrical and mechanical systems, and their integration
- Inspection and diagnosis
- Repair, overhaul, and service

Total Duration: 6 Hrs

Module A : 3 Hrs

Module B : 3 Hrs

Section - B

B. Test Project

Brief about the Test Project

| Module Code | Module Name | Max. Marks | Time |
|-------------|---|------------|-----------|
| A | Electrical Fault Finding (Engine Management System & Body Electrical) | 15 | 3.0 Hours |
| B | Engine Mechanical | 15 | 3.0 Hours |

Description of Tasks

Electrical Fault Finding (Engine Management System & Body Electrical):

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, Power Windows etc. Candidate should be able to use Service Manual and Wiring Diagrams.

Engine Mechanical:

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 criterias which are judged for assessment.

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

- Candidate in position to operate productive equipment's.
- Candidate understands 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 15 for Regional 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 are 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 $(2+2+1/9)*1 = 0.55$ marks for that aspect (out of 1).

For Measurement marking, maximum marks for each aspect should not be more than 2% of maximum marks. Since maximum marks for each module are 10, so mark for each aspect cannot be more than 0.2. Candidate will be awarded either full marks or zero against each aspect.

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.

Recommended total no. of aspects: 75 to 200. (Sample Test Projects attached herewith have more aspects- for understanding and detailing purpose).

| REGIONAL LEVEL | | |
|--|----------------------------|---------------------------|
| TASK SHEET -ENGINE MANAGEMENT SYSTEM | | |
| <u>BAY NO</u> : | <u>TIME</u> : 03 Hours | |
| <u>COMPETITOR NAME</u> : | <u>MARKS AWARDED</u> : | |
| <u>ORGANISATION</u> : | <u>MAX. MARKS</u> : 20 | |
| <u>JURY NAME</u> : | - | |
| <u>VEHICLE</u> : | - | |
| | - | |
| TASK | | |
| INITIALLY WHEN VEHICLE WAS STARTED, IT WAS HAVING LOW PICK UP AND MISFIRING. NOW IT IS NOT CRANKING. DO NECESSARY REPAIRS AND TUNE THE ENGINE TO BEST OPERATING CONDITION. | | |
| YOU CAN USE AVAILABLE MEASURING TOOLS AND DIAGNOSTIC TOOLS WHEREVER NECESSARY. | | |
| SHARE ALL YOUR OBSERVATIONS WITH JURY. | | |
| | | |
| | Candidate Signature | |
| MARKING CRITERIA - REGIONAL LEVEL | | |
| MODULE A : ENGINE MANAGEMENT SYSTEM | | |
| ENGINE MANAGEMENT SYSTEM | | |
| <u>BAY NO</u> : | <u>DATE</u> : | <u>TIME</u> : 3 Hours |
| <u>COMPETITOR NAME</u> : | <u>ORGANISATION NAME</u> : | <u>MARKS AWARDED</u> : |
| <u>JURY NAME</u> : | <u>ORGANISATION NAME</u> : | <u>MAX. MARKS</u> : 20.00 |
| | | <u>JURY SIGN</u> : |
| <u>SUB CRITERION : SAFETY AND HOUSE KEEPING</u> | | |

| <u>ASPECT ID</u> | <u>MAX. MARKS</u> | <u>DESCRIPTION</u> | <u>SPECIFIED VALUE</u> | <u>MARKS AWARDED</u> | <u>REMARKS</u> |
|------------------|-------------------|---|------------------------|----------------------|----------------|
| A1 | 0.1 | PPE USED - WORK WEAR - APRON | | | |
| A2 | 0.1 | PPE USED - SAFETY SHOES, GOGGLE (WHEREVER NECESSARY) | | | |
| A3 | 0.1 | VEHICLE COVERS USED - FENDER COVER, FRONT COVER ("0" MARKS IF ANY ONE COVER DID NOT USE / DID NOT ASK FOR) | | | |
| A4 | 0.1 | VEHICLE COVERS USED - SEAT COVER, STEERING COVER ("0" MARKS IF ANY ONE COVER DID NOT USE / DID NOT ASK FOR) | | | |
| A5 | 0.2 | NO DAMAGE TO TOOLS, EQUIPMENTS & VEHICLE (" 0 " MARKS IF DAMAGED) | | | |
| A6 | 0.2 | NO UNSAFE WORK PRACTICES | | | |
| A7 | 0.2 | RESTORES WORK AREA WITHIN TASK TIME (WORKSTATION, TOOLS & EQUIPMENTS) ("0" MARKS IF NOT RESTORED) | | | |
| TOTAL | 1 | | TOTAL | | |

TASK 1 : POWER SUPPLY

| <u>ASPECT ID</u> | <u>MAX. MARKS</u> | <u>DESCRIPTION</u> | <u>SPECIFIED VALUE</u> | <u>MARKS AWARDED</u> | <u>REMARKS</u> |
|------------------|-------------------|--|------------------------|----------------------|----------------|
| A8 | 0.2 | CHECKS BATTERY VOLTAGE | > 12 VOLTS | | |
| A9 | 0.2 | CHECKS BATTERY TERMINALS ARE FITTED PROPERLY | | | |
| A10 | 0.2 | CHECKS BATTERY NEGATIVE CABLE IS FITTED TO GROUND PROPERLY | | | |

| | | | | | |
|-----|-----|---|---|--|--|
| A11 | 0.2 | REQUESTS FOR BATTERY CHARGER | AS A BACK UP IF BATTERY VOLTAGE GOES DOWN DURING TASK. | | |
| A12 | 0.2 | CHECKS THE ENGINE OIL LEVEL PRIOR TO CRANKING | | | |
| A13 | 0.1 | CONFIRMS THE FAULT- VEHICLE NOT CRANKING AND ALSO NO LIGHTS IN INSTRUMENT CLUSTER IN IGNITION ON POSITION | | | |
| A14 | 0.2 | CORRECTLY LOCATES THE FUSE F8 IN PASSENGER CABIN FUSE BOX. ("0" MARKS IF CORRECT WIRING DIAGRAM IS NOT REFERED) | F8 | | |
| A15 | 0.1 | DIAGNOSE DEFECTIVE FUSE F8 IN PASSENGER CABIN FUSE BOX ("0" MARKS IF MULTIMETER NOT USED) | < 1Ω | | |
| A16 | 0.2 | CONFIRMS THE CAUSE FOR FUSE BLOWN ("0" MARKS IF MULTIMETER NOT USED) | | | |
| A17 | 0.4 | DIAGNOSE THE SHORT CIRCUIT ("0" MARKS IF MULTIMETER IS NOT USED) | | | |
| A18 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A19 | 0.1 | REPLACES THE FUSE F8 WITH CORRECT RATING ("0" MARKS IF INCORRECT RATING FUSE USED/IF MORE THAN TWO FUSES ARE USED) | | | |
| A20 | 0.1 | CHECKS SUPPLY VOLTAGE AT FUSE F8. FINDS OK | | | |
| A21 | 0.1 | FINDS NO VOLTAGE SUPPLY AT IGNITION SWITCH | | | |
| A22 | 0.1 | CORRECTLY LOCATES THE FUSE F16 IN PASSENGER COMPARTMENT FUSE BOX ("0" MARKS IF WIRING DIAGRAM IS NOT REFERED) | F16 | | |
| A23 | 0.1 | DIAGNOSE DEFECTIVE FUSE F16 IN PASSENGER COMPARTMENT FUSE BOX ("0" MARKS IF MULTIMETER NOT USED) | < 1Ω | | |
| A24 | 0.2 | CONFIRMS THE CAUSE FOR FUSE BLOWN. ("0" MARKS IF MULTIMETER NOT USED) | | | |

| | | | | | |
|--|--------------------------|--|-------------------------------|-----------------------------|-----------------------|
| A25 | 0.1 | REPLACES THE FUSE F16 WITH CORRECT RATING ("0" MARKS IF INCORRECT RATING FUSE USED) | | | |
| A26 | 0.1 | STILL FINDS NO VOLTAGE SUPPLY AT IGNITION SWITCH | | | |
| A27 | 0.5 | DIAGNOSE DEFECTIVE WIRE BETWEEN FUSE F16 AND IGNITION SWITCH ("0" MARKS IF MULTIMETER IS NOT USED) | | | |
| A28 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A29 | 0.1 | CHECKS THE DIRECT BATTERY SUPPLY VOLTAGE AT INSTRUMENT CLUSTER CONNECTOR | | | |
| A30 | 0.1 | CHECKS THE IGNITION SUPPLY VOLTAGE AT INSTRUMENT CLUSTER CONNECTOR | | | |
| A31 | 0.5 | CHECKS AND DIAGNOSE DEFECT IN GROUND CONNECTION TO INSTRUMENT CLUSTER. ("0" MARKS IF MULTIMETER IS NOT USED) | EA10A/B | | |
| A32 | 0.1 | REPAIRS INSTRUMENT CLUSTER GROUND CONNECTION | | | |
| A33 | 0.4 | RECONFIRMS THE GROUND CONNECTION TO INSTRUMENT CLUSTER | | | |
| TOTAL | 4.80 | | TOTAL | | |
| <u>TASK 2 : ENGINE MANAGEMENT</u> | | | | | |
| <u>ASPECT ID</u> | <u>MAX. MARKS</u> | <u>DESCRIPTION</u> | <u>SPECIFIED VALUE</u> | <u>MARKS AWARDED</u> | <u>REMARKS</u> |
| A34 | 0.1 | CONNECTS THE TDS (TATA DIAGNOSTIC SYSTEM) PROPERLY. SELECTS CORRECT VEHICLE VARIANT AND INTERFACE | | | |
| A35 | 0.3 | DIAGNOSE WIRE DEFECT AT DIAGNOSTIC LINK CONNECTOR (DLC) | | | |
| A36 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A37 | 0.1 | OBSERVERS THAT ONLY INSTRUMENT CLUSTER IS COMMUNICATING WITH TDS | | | |
| A38 | 0.5 | CHECKS VEHICLE CAN BUS HIGH (CAN H) WIRE FOR SHORT TO GROUND | | | |

| | | | | | |
|-----|-----|---|----------------|--|--|
| A39 | 0.5 | CHECKS VEHICLE CAN BUS LOW (CAN L) WIRE FOR SHORT TO GROUND | | | |
| A40 | 0.5 | CHECKS VEHICLE CAN BUS HIGH (CAN H) WIRE FOR SHORT TO POSITIVE | | | |
| A41 | 0.5 | CHECKS VEHICLE CAN BUS LOW (CAN L) WIRE FOR SHORT TO POSITIVE | | | |
| A42 | 0.5 | CHECKS VEHICLE CAN BUS HIGH & LOW WIRE FOR SHORT TO EACH OTHER | | | |
| A43 | 0.5 | DIAGNOSE DEFECT IN VEHICLE CAN BUS | | | |
| A44 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A45 | 0.1 | AGAIN CHECKS COMMUNICATION OF ECUs WITH LAPTOP | | | |
| A46 | 0.1 | OBSERVES THAT THERE IS NO COMMUNICATION WITH EMS ECU | | | |
| A47 | 0.1 | CHECKS THE IGNITION SUPPLY VOLTAGE TO THE EMS ECU | | | |
| A48 | 0.1 | CORRECTLY LOCATES FUSE EF43 IN UNDERBONNET FUSE BOX ("0" MARKS IF WIRING DIAGRAM IS NOT REFERED) | EF43 | | |
| A49 | 0.1 | DIAGNOSE DEFECTIVE FUSE EF43 IN UNDERBONNET FUSE BOX ("0" MARKS IF MULTIMETER NOT USED). | < 1Ω | | |
| A50 | 0.2 | CONFIRMS THE CAUSE FOR FUSE BLOWN ("0" MARKS IF MULTIMETER NOT USED) | | | |
| A51 | 0.1 | REPLACES THE FUSE EF43 WITH CORRECT RATING ("0" MARKS IF INCORRECT RATING FUSE USED) | | | |
| A52 | 0.2 | DIAGNOSE DEFECTIVE IGNITION RELAY ("0" MARKS IF MULTIMETER IS NOT USED) | R17 | | |
| A53 | 0.1 | REPLACES THE DEFECTIVE IGNITION RELAY | | | |
| A54 | 0.1 | CORRECTLY IDENTIFIES FUSE EF10 IN UNDERBONNET FUSE BOX ("0" MARKS IF WIRING DIAGRAM IS NOT REFERED) | EF10 | | |
| A55 | 0.1 | DIAGNOSE DEFECTIVE FUSE EF10 IN UNDERBONNET FUSE BOX ("0" MARKS IF MULTIMETER IS NOT USED) | < 1Ω | | |

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|-----|-----|---|----------------|--|--|
| A56 | 0.2 | CONFIRMS THE CAUSE FOR FUSE BLOWN ("0" MARKS IF MULTIMETER NOT USED) | | | |
| A57 | 0.1 | REPLACES THE FUSE EF10 WITH CORRECT RATING ("0" MARKS IF INCORRECT RATING FUSE USED) | | | |
| A58 | 0.2 | CHECKS THE GROUND CONNECTION OF EMS ECU AT CORRECT PINS . FINDS NOT OK. | | | |
| A59 | 0.5 | DIAGNOSE DEFECTIVE GROUND CONNECTION TO EMS ECU | EA7A/B | | |
| A60 | 0.1 | REPAIRS THE DEECTIVE GROUND CONNECTION TO EMS ECU | | | |
| A61 | 0.3 | RECONFIRMS ALL THE GROUND CONNECTIONS TO EMS ECU ARE OK | | | |
| A62 | 0.1 | CORRECTLY IDENTIFIES FUSE EF8 IN UNDERBONNET FUSE BOX ("0" MARKS IF CORRECT WIRING DIAGRAM IS NOT USED) | EF8 | | |
| A63 | 0.1 | DIAGNOSE DEFECTIVE FUSE EF8 IN UNDERBONNET FUSE BOX ("0" MARKS IF FUSE NOT CHECKED WITH MULTIMETER) | < 1Ω | | |
| A64 | 0.2 | CONFIRMS THE CAUSE FOR FUSE BLOWN ("0" MARKS IF MULTIMETER NOT USED) | | | |
| A65 | 0.1 | REPLACES THE FUSE EF8 WITH CORRECT RATING ("0" MARKS IF INCORRECT RATING FUSE USED) | | | |
| A66 | 0.4 | DIAGNOSE THE DEFECTIVE WIRE CONNECTION FOR EMS MAIN RELAY DRIVER AT EMS ECU CONNECTOR | | | |
| A67 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A68 | 0.1 | CRANKS THE ENGINE AGAIN. OBSERVES THAT STILL ENGINE IS NOT CRANKING | | | |
| A69 | 0.2 | DIAGNOSE DEFECTIVE STARTER RELAY 2 ("0" MARKS IF MULTIMETER IS NOT USED) | R19 | | |
| A70 | 0.1 | REPLACES DEFECTIVE STARTER RELAY 2 | | | |
| A71 | 0.2 | DIAGNOSE LOOSE CLUTCH SWITCH CONNECTOR | | | |
| A72 | 0.1 | FIXES CLUTCH SWITCH CONNECTOR PROPERLY | | | |

| | | | | | |
|-----|-----|--|----------------------------|---|---|
| A73 | 0.5 | DIAGNOSE DEFECTIVE CLUTCH SWITCH INPUT TO EMS ECU ("0" MARKS IF MULTIMETER IS NOT USED) | | | |
| A74 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A75 | 0.1 | CRANKS THE ENGINE. | ENGINE SHOULD CRANK | | |
| A76 | 0.1 | OBSERVES RELATED DTC IN TDS. NOTE FOR JURY : IF DTC IS NOT PRESENT. JURY HAS TO INFORM THE DTC RELATED TO CRANK SHAFT POSITION SENSOR TO COMPETITOR. | - | - | - |
| A77 | 0.5 | CHECKS AND DIAGNOSE CRANK SHAFT POSITION SENSOR ("0" MARKS IF NOT CHECKED WITH MULTIMETER AND IF SERVICE MANUAL IS NOT USED) | | - | - |
| A78 | 0.2 | REPLACES THE CRANK SHAFT POSITION SENSOR | | | |
| A79 | 0.5 | LOGICALLY DIAGNOSE DEFECTIVE IGNITION COIL CONTROL CIRCUIT | | | |
| A80 | 0.1 | JURY TO REPAIR THE DEFECT | | | |
| A81 | 0.1 | CORRECTLY IDENTIFIES FUSE EF20 IN UNDERBONNET FUSE BOX ("0" MARKS IF WIRING DIAGRAM IS NOT REFERED) | EF20 | | |
| A82 | 0.1 | DIAGNOSE DEFECTIVE FUSE EF20. IN UNDERBONNET FUSE BOX("0" MARKS IF MULTIMETER IS NOT USED) | < 1Ω | | |
| A83 | 0.1 | REPLACES THE DEFECTIVE FUSE EF20 WITH CORRECT RATING ("0"MARKS IF INCORRECT RATING FUSE IS USED) | | | |
| A84 | 0.1 | LOGICALLY DIAGNOSE THE LOOSE FUEL PUMP CONNECTOR | | | |
| A85 | 0.1 | FIXES THE FUEL PUMP CONNECTOR PROPERLY | | | |
| A86 | 0.2 | DIAGNOSE DEFECTIVE FUEL RELAY ("0" MARKS IF MULTIMETER IS NOT USED) | R11 | | |
| A87 | 0.1 | REPLACES THE DEFECTIVE FUEL PUMP RELAY | | | |
| A88 | 0.5 | DIAGNOSE THE DEFECTIVE FUEL PUMP GROUND ("0" MARKS IF MULTIMETER IS NOT USED) | EA3A/B | | |

| | | | | | |
|--------------|--------------|------------------------------|----------------------------|---|--|
| A89 | 0.2 | REPAIRS THE FUEL PUMP GROUND | | | |
| A90 | 0.1 | CHECKS ENGINE STARTING | ENGINE SHOULD START | - | |
| TOTAL | 11.80 | | TOTAL | | |

TASK 3: ENGINE TUNING

| <u>ASPECT ID</u> | <u>MAX. MARKS</u> | <u>DESCRIPTION</u> | <u>SPECIFIED VALUE</u> | <u>MARKS AWARDED</u> | <u>REMARKS</u> |
|------------------|-------------------|---|------------------------|----------------------|----------------|
| A91 | 0.2 | DIAGNOSE AND REPAIRS THE HIGH TENSION CORD CONNECTIONS | | - | - |
| A92 | 0.6 | DIAGNOSE THE DEFECTIVE SPARK PLUG | | | |
| A93 | 0.4 | REPLACES THE DEFECTIVE SPARK PLUG WITH GOOD ONE ("0" MARKS IF SPECIFIED TORQUE IS NOT APPLIED) | | | |
| A94 | 0.2 | CHECKS ENGINE OPERATION | | - | |
| A95 | 0.2 | CHECKS THE VOLTAGE SUPPLY TO BOOST PRESSURE SENSOR | - | - | - |
| A96 | 0.5 | DIAGNOSE THE DEFECT IN BOOST PRESSURE SENSOR WIRING ("0" MARKS IF MULTIMETER IS NOT USED) | | - | - |
| A97 | 0.2 | CONCLUDES DEFECT IN BOOST PRESSURE SENSOR WIRING NOTE FOR JURY : COMPETITOR HAS TO ONLY CONCLUDE THE DEFECT USING MULTIMETER.NO NEED TO REPAIR THE DEFECT. ("0" MARKS IF MULTIMETER IS NOT USED) | | - | - |
| A98 | 0.1 | USING TDS ERASES THE DTCS. | | - | - |
| TOTAL | 2.40 | | <u>TOTAL</u> | | |

(NAME & SIGN OF JURY MEMBER)

(NAME & SIGN OF ASDC MEMBER)

| MARKING CRITERIA - REGIONAL LEVEL | | | | | | | | |
|-----------------------------------|--|---|---|-------------|--|--|-------------|----------|
| | MODULE B : | ENGINE MECHANICAL | | | | | | |
| | BAY NO : DATE : | | | | TIME | : 3 Hours | | |
| | COMPETITOR NAME : ORGANISATION NAME : | | | | MARKS AWARDED : | | | |
| | JURY NAME : ORGANISATION NAME : | | | | MAX. MARKS : 20.00 | | | |
| | | | | | JURY SIGN : | | | |
| Sub Criteria ID | Sub Criteria Name or Description | Aspect Type O = Obj S = Sub J = Judg | Aspect - Description | Judge Score | Extra Aspect Description (Obj or Sub) OR Judgement Score Description (Judg only) | Requirement or Nominal Size (Obj Only) | WSS Section | Max Mark |
| D1 | Preparation | O | Organise work station, tools, manuals | | | | 1 | 0.30 |
| | | O | Check engine oil - none in the engine | | | | 4 | 0.10 |
| | | O | Check engine free rotation | | | | 4 | 0.20 |
| | | O | Calibrate measuring equipment - Vernier calliper | | | | | 0.10 |
| | | O | Calibrate measuring equipment - Micrometer | | | | | 0.30 |
| | | O | Calibrate measuring equipment - Dial gauge | | | | 1 | 0.10 |
| D2 | Engine Dismantling | O | loosen the alternator brace nut and remove accesoris belt. | | | | | 0.10 |
| | | O | Remove alternator assembly | | | | | 0.10 |
| | | O | Remove Intake Pipe fitted over rocker cover, breather Hose, then Rocker cover | | | | | 0.10 |
| | | O | Remove Injector wiring connector, | | | | | 0.10 |

| | | | | | | | | |
|--|--|---|---|--|---|--|---|------|
| | | | leak off pipe from all injector | | | | | |
| | | O | Remove high pressure pipe from injector ,common rail and pump | | | | | 0.10 |
| | | O | Remove Injector mounting Clamps, Remove the injectors | | | | | 0.10 |
| | | S | | | Plastic cap / plug to be fitted over the injector threads and tip to avoid dirt entry and damages | | | 0.20 |
| | | S | | | Two Injectors washers are missing - observation to shared to the jury | | | 0.30 |
| | | O | Remove common rail assembly | | | | | 0.10 |
| | | O | Remove rockershaft assembly | | | | | 0.10 |
| | | O | Remove push rod | | | | | 0.10 |
| | | O | Remove turbo charger pipe and make sure pipe line should free | | 0.2 - if Plugs / caps used for Turbo (0.1 if not) | | | 0.20 |
| | | O | Remove cylinder head bolts | | | | 1 | 0.10 |
| | | S | | | If bolt removing sequence is followed - Give Marks | | | 0.20 |
| | | S | | | Use MST 127 for removing and refitting the cylinder head bolts no. 2, 7 & 9 | | | 0.20 |

| | | | | | | | | |
|--|--|---|---|--|---|--|--|------|
| | | O | Remove Cylinder Head Assembly, Remove Gasket and Discard | | | | | 0.10 |
| | | O | Remove Exhaust and Intake Manifold | | | | | 0.10 |
| | | O | Lock the flywheel using special tool | | No marks if Special tool is not used | | | 0.30 |
| | | O | Remove damper pulley use flywheel lock tool | | | | | 0.10 |
| | | O | Remove high pressure pump assembly | | use special tool. | | | 0.10 |
| | | O | Remove flywheel assembly | | | | | 0.10 |
| | | S | | | 02 Flywheel bolt has no washer - if reported Give Marks | | | 0.20 |
| | | O | Remove oil sump | | follow the sequence for loosening the bolt. | | | 0.20 |
| | | O | Remove oil pump and strainer assembly | | | | | 0.10 |
| | | O | Remove the ladder mounting bolt from crankcase | | | | | 0.10 |
| | | O | loosen and remove rear oil seal retainer plate mounting bolt, remove plate & seal | | follow the bolt removal sequence - STAR sequence | | | 0.20 |
| | | O | Remove the timing cover and remove HP Pump gear carefully | | | | | 0.20 |
| | | O | Remove the Idler and crankshaft gear | | | | | 0.10 |
| | | O | Remove the camshaft along with gear. | | | | | 0.10 |
| | | O | Remove the connecting Rod big end, ensure position | | | | | 0.10 |

| | | | | | | | | |
|--|--|---|---|--|---|--|---|------|
| | | O | Remove pistons of all cylinders - (use mallet if required) | | | | | 0.10 |
| | | S | | | Piston of Cylinder #02 is fitted wrong w.r.t. arrow mark - if reported - Give Marks | | | 0.30 |
| | | O | Remove main bearing cap, give numbering if not available. | | removed caps to be kept properly - in the same sequence as removed | | | 0.20 |
| | | O | Remove crankshaft carefully from block. | | | | | 0.10 |
| | | O | Remove the thrust washer carefully | | | | | 0.10 |
| | | O | Remove Tappet using magnet before rotating the engine | | | | | 0.10 |
| | | | | | NO NEED TO REMOVE TAPPET, (if CAMSHAFT refitted after inspection - while the engine is in inverted condition) | | | 0.10 |
| | | O | Remove the cylinder liner using mST-145 | | | | | 0.30 |
| | | O | Remove Water and oil separator rubber 'O' ring without damage. | | | | | 0.20 |
| | | O | Remove Inlet & Exhaust valves from of #01 cylinder from Cylinder head | | | | 1 | 0.20 |

| | | | | | | | | | |
|----|--------------------------|---|---|--|--|--|---|------|------|
| | | S | | | If proper tool of Valve Spring compressor is used give marks | | | 0.20 | |
| | | S | | | Extra Washer observed at Inlet Valve - if reported give marks | | | 0.20 | |
| | | O | Remove piston rings of Piston of cylinder # 04 without damage | | | | 5 | 0.20 | |
| | | S | | | If proper tool of Piston Ring Expander is used give marks | | | 0.20 | |
| | | S | | | Piston Ring - Compression ring is Upside Down - if reported give marks | | | 0.30 | |
| | | | | | | | | | |
| D3 | Measurement & Inspection | | Measure Cylinder Head Warp | | | | | | |
| | | O | Inspected & ensured clean cylinder head surface & free of damage before checking for warp | | | | 1 | 0.20 | |
| | | O | Measured warp diagonally (2) & longitudinally (2) and vertically (3) | | | | | | 0.30 |
| | | O | Measured cylinder head overall height | | | | 1 | 0.20 | |
| | | O | Measure cam lobe height | | | | 1 | 0.30 | |
| | | O | Measure straightness of camshaft /Bend | | | | 1 | 0.20 | |
| | | O | Measure inlet valve spring free height. | | | | | | 0.10 |
| | | | | | | | | | |

| | | | | | | | | |
|--|--|---|--|--|--|--|---|------|
| | | O | Measure cylinder exhaust 'valve spring' free height | | | | 1 | 0.10 |
| | | O | Measure exhaust valve stem diameter | | | | 1 | 0.10 |
| | | O | Measure inlet valve stem diameter | | | | | 0.10 |
| | | O | Measure Push rod bent / straightness, refer specification | | | | | 0.20 |
| | | O | Measure Rocker shaft bent /straightness | | | | | 0.30 |
| | | S | | | | Rocker shaft assy has wrong position of washers - if reported - Give Marks | | 0.30 |
| | | O | measure rocker and shaft clearance | | | | | 0.20 |
| | | S | | | | Reassembled the Rocker Shaft Assembly with correct position of components | | 0.30 |
| | | O | Measured piston diameter (correct position) | | | | 1 | 0.20 |
| | | O | Measure the top compression ring end Gap- | | | | 1 | 0.20 |
| | | O | Measure the piston ring Lateral gap Gap | | | | 1 | 0.30 |
| | | O | Measure the liner projection, note - oil and water separator ring should be removed carefully. | | | | 1 | 0.20 |
| | | O | Measure Crankshaft main journal diameter | | | | 1 | 0.20 |
| | | O | Measured crankshaft thrust clearance / end | | | | 1 | 0.30 |

| | | | | | | | | | |
|----|------------|---|--|--|---|--|---|------|------|
| | | | float | | | | | | |
| | | ○ | Measure flywheel run-out / Flatness | | | | | 0.20 | |
| | | ○ | Measure accessories belt tension using belt tension gauge | | | | | 0.30 | |
| | | | | | | | | | |
| D4 | Reassembly | ○ | Lubricate rings & Check free movement prior to refitting | | | | 5 | 0.20 | |
| | | | | | Candidate should ask for NEW RING SET; (to be prompted to use same assuming NEW) | | | 0.20 | |
| | | ○ | Refit rings in correct position without damage using ring expander. | | | | | 0.10 | |
| | | | | | correct position is 120 degree offset (if correct position is not adhered - no marks to be awarded) | | | 0.20 | |
| | | ○ | Refit piston correctly protecting the crankshaft journals first time | | | | 5 | 0.20 | |
| | | ○ | Refit Big End cap bolts | | | | 2 | 0.20 | |
| | | | | | Big End Cap bolts to be replaced each time these are opened if asked - Give Marks | | | 5 | 0.30 |
| | | ○ | Refit Main bearing cap bolts | | | | | 0.10 | |

| | | | | | | | | |
|----|-----------------|---|--|--|---|--|---|------|
| | | | | | Measure length of bolt and replace if found out of specs | | | 0.20 |
| | | O | Asked for sealant - sump etc... | | | | 2 | 0.20 |
| | | O | Torqued M/Brg & sump bolts in correct order | | | | 5 | 0.30 |
| | | O | Requested new cylinder head gasket & bolts. | | | | 2 | 0.10 |
| | | J | | | Measure length of bolt and replace if found out of specs; Use the Same Gasket- Assuming NEW | | | 0.30 |
| | | O | Requested Molycote G Rapid Plus E3 | | Jury to Prompt : Install without Molycote - Assume Applied | | 2 | 0.20 |
| | | O | Torque cylinder head bolts correctly and in order | | | | 1 | 0.20 |
| | | O | Engine timing set correctly - as per the procedure | | | | 1 | 0.40 |
| | | O | Tappet setting | | Valve Clearance adjusted properly as specified for INTAKE VALVES | | | 0.30 |
| | | O | | | Valve Clearance adjusted properly as specified for EXHAUST VALVES | | | 0.30 |
| D5 | Task Completion | O | Rotate the engine 2 full turns to check correct assembly | | | | 1 | 0.50 |

| | | | | | | | | |
|--|--|---|--|--|--|--|---|------|
| | | O | Engine and test report completed | | | | 2 | 0.60 |
| | | O | Used safety glasses appropriately | | | | 1 | 0.20 |
| | | J | All tools returned to correct location | | | | 1 | 0.60 |
| | | | | | | | | |
| | | J | | | 0.2 - if 2 correct faults Identified | | 2 | 0.60 |
| | | J | | | 0.4 - if 4 correct faults Identified | | 2 | |
| | | J | | | 0.6 - if all 6 correct faults Identified | | 4 | |
| | | | | | | | | |
| | | J | Work area clean & tidy throughout the module | | 0 - Not all tools return | | 1 | 0.60 |
| | | J | | 0.1 - Special tools only stored and cleaned correctly | | | | |
| | | J | | 0.2 - Toolbox tools only stored and cleaned correctly | | | | |
| | | J | | 0.3 - Special as well as General tools stored and cleaned Properly | | | | |
| | | | | | | | | |
| | | J | | 0 - Work area messy | | | | |
| | | J | | 0.1 - Below industry standard: spills not cleaned up; tools left on the floor; components not kept separate; waste not | | | | |

| | | | | | | | |
|------------------------------|--|---|--|--|--|------------------------------|-----------|
| | | | | | removed correctly | | |
| | | J | | | 0.2 - Maintain industry standard: Spills cleaned up at the end of the module; tools left untidy on the bench; components not sorted or in order; waste removed but disposed of. | | |
| | | J | | | 0.3 - Exceed industry standard: Spills cleaned up immediately; all components and tools laid out in order; waste removed and disposed of in accordance with environmental regulations. | | |
| | | | | | | TOTAL | 20 |
| (NAME & SIGN OF JURY MEMBER) | | | | | | (NAME & SIGN OF ASDC MEMBER) | |

Section - D

D. Infrastructure List

- Workshop Installation-Tools & Equipment positioned by Organizers
- 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 equipments for 'Electrical Fault Finding' module:

- Digital multi-meter
- Diagnostic software
- General tools set
- Safety PPEs – as per details given in Section E.

Summary of tools and equipments for 'Engine Mechanical' module:

- General tools set
- Special tools – Crankshaft, Camlock, Cranklock, Torx Male & Female socket set (Specific)
- Torque wrenches
- Micrometer screw gauge, Dial Bore Gauge, Vernier-calliper, Dial gauge, Magnetic stand
- Feeler gauge
- Piston ring compressor
- Piston ring expander
- Safety PPEs – as per details given in Section F.

Note: Exact requirement depends on tasks and resources used during competition.

Section – E

E. Instructions for candidates

The participating Competitors must ensure:

- Candidate should perform each and every task with proper PPE.
- Candidate should report on given time at test centre.
- Candidate will not get any addition 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.
- Candidates 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.

MODULE A – Electrical Fault Finding

EQUIPMENT

- Car Model :
- Digital multi-meter
- 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.
- Following systems are not working. You are required to make these systems operational:
 1. Roof lamp
 2. Fr.fog lamp
 3. Front wipers
 4. Head lamps
 5. Heated rear window

TIME ALLOWED 3.0 Hours

| COMPETITOR NAME | ORGANISATION/INSTITUTE | MODULE | MAX MARKS |
|-----------------|------------------------|--------|-----------|
| | | A | 15 |

| | INSTRUCTIONS | POSSIBLE MARKS | REMARKS |
|----|--------------------------------|----------------|---------|
| A1 | SAFETY AND HOUSEKEEPING | 2.5 | |
| A2 | VEHICLE NOT STARTING | 3.0 | |
| A3 | FRONT ROOF LAMP NOT WORKING | 1.8 | |
| A4 | FRONT FOG LAMP NOT WORKING | 1.3 | |
| A5 | FRONT WIPERS NOT WORKING | 1.7 | |
| A6 | HEAD LAMPS NOT WORKING | 3.3 | |
| A7 | HEATED REAR WINDOW NOT WORKING | 1.4 | |
| | | MAX 15 | |

MODULE 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.
- Assemble the engine

TIME ALLOWED 3 Hours

| COMPETITOR NAME | ORGANISATION/INSTITUTE | MODULE | MAX MARKS |
|-----------------|------------------------|--------|-----------|
| | | B | 15 |

| | INSTRUCTIONS | POSSIBLE MARKS | REMARKS |
|----|-------------------------|----------------|---------|
| B1 | SAFETY AND HOUSEKEEPING | 2.0 | |
| B2 | ENGINE DISMANTLING | 5.3 | |
| B3 | MEASUREMENTS | 2.3 | |
| B4 | ENGINE ASSEMBLY | 5.4 | |
| | | MAX 15 | |

REPORT SHEET:

| SR. NO. | MEASUREMENTS | ACTUAL VALUE |
|---------|-------------------------|--------------|
| 1 | MEASURE PISTON DIA (OD) | |
| 2 | HEAD GASKET SELECTION | |
| 3 | CRANKSHAFT END PLAY | |

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. 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 PROTECTIVE 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 |

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

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 |