



Sample Test Project

District / Zonal Skill Competitions

Skill- Heavy Vehicle Maintenance

Category: Transportation & Logistics

Table of Contents

A. Preface.....	3
B. Test Project.....	4
C. Marking Scheme	14
D. Infrastructure List	16
E. Instructions for candidates	18
F. Health, Safety, and Environment.....	19

Section - A

A. Preface

Skill Explained:

Heavy Vehicle Maintenance is about, diagnoses, and repairs of large machines and industrial equipment including towed and self-propelled equipment used. The technician must be able to maintain, diagnose, and repair internal combustion engines and components on stationary, mobile, and earth-moving equipment.

Maintenance, diagnosis, and repair can involve individual components or entire systems, requiring the technician to have skill with engines, hydraulics, drive trains, electronics, braking systems, and much more. The technician must use specific tools to diagnose function, make adjustments, repair, or replace defective components or systems, test repairs for proper performance, interpret instructions in technical manuals, write service reports, and ensure that the work meets manufacturers' specifications and the requirements of legislation.

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

Theory	:	1 Hrs
Practical	:	2 Hrs

Section - B

B. Test Project

Total No. of Questions: 60

Maximum Marks: 60

Time Allotted: 60 Minutes

1. Which of the following may cause white smoke in Diesel Engines:
 - a. Choked Air filter
 - b. Excessive humid air
 - c. Excessive piston ring gaps
 - d. Leaking valve oil seal

2. Viscous coupling fan can be checked for its serviceability:
 - a. At 80 to 95°C of engine temperature fan speed will be 90%
 - b. At 40 to 50°C of engine temperature fan speed will be 90%
 - c. At 80 to 90°C of engine temperature fan speed will be 50%
 - d. At 40 to 50°C of engine temperature fan speed will be 50%

3. Probable cause for low pick up of a CRDI engine can be:
 - a. More fueling in Injector
 - b. Incorrect Injector coding
 - c. Boost Pressure signal too low
 - d. Faulty Crank sensor

4. A customer complaint that the height of the vehicle in left is lesser than right or vehicle is little tilt towards left what will be your solution
 - a. Increase the Road spring leaf in Left
 - b. Decrease the Road Spring leaf in Right
 - c. Adjust the torsion bar
 - d. Put a pad under the load body in left.

5. A CRDI vehicle reported with a concern that Accelerator pedal not responding after travelling 50 km and then responds when started after parking for half an hour for another 20 to 30 kms. What can be the cause of the above condition?
 - a. Engine overheating and ECU is in Limp home mode
 - b. Air trapped in fuel system
 - c. Brake binding
 - d. MAF sensor faulty

6. Probable cause for engine oil thickening can be
 - a. Incorrect grade of oil
 - b. Combustion gas leak into oil sump
 - c. Incorrect quantity of Oil
 - d. All the above

7. L- B - W marks on Alternator indicates:-
 - a. L- Lamp , B- Battery & W – Electric Field
 - b. L – Light , B – Back Flow & W – Electric Field
 - c. L- Lamp , B- Battery & W- Wave Form
 - d. L- Linear, B- Battery & W- Wave Form

8. A technician checked resistance between ground circuit terminal of ECU and ground. Multimeter displayed over range, what could be concluded from the observation?
- ECU ground connection is okay
 - ECU ground connection is open
 - Very low resistance in ECU ground circuit
 - ECU ground connection is short to voltage

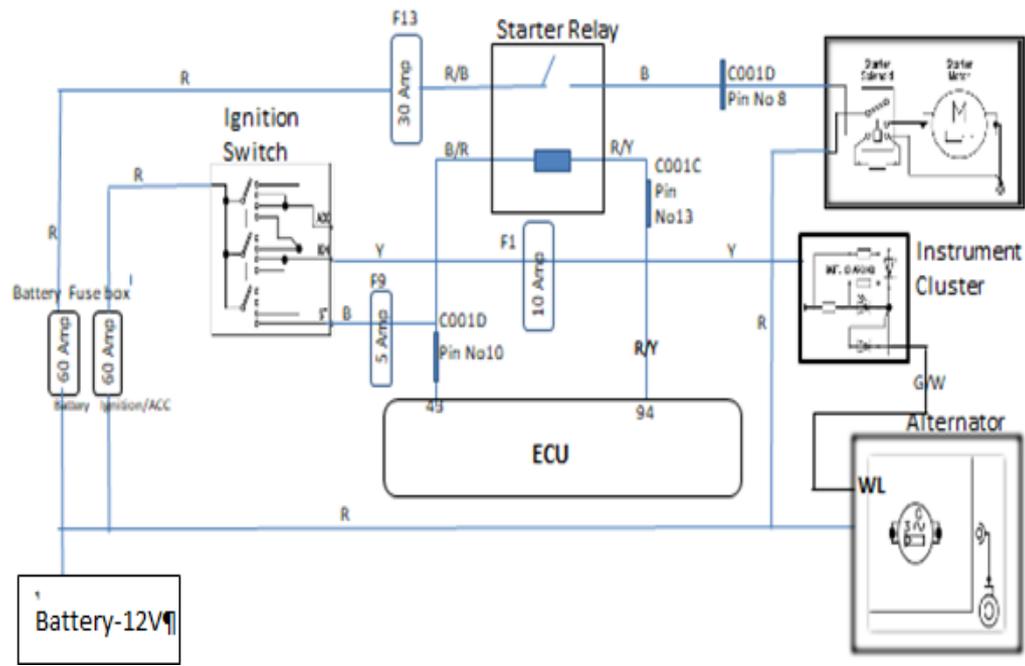
9. Infer defect from the below compression readings of an diesel engine

	Cylinder 1	Cylinder 2	Cylinder 3	Cylinder 4
DRY	18.4 Bar	0	0	18.6 Bar
WET	19.6 Bar	0	0	19.8 Bar

- Compression ring gap is inline in 2 & 3 Cylinder
 - No 2 & 3 cylinder Valves are bend
 - Bore wear out of No 2 & 3 Cylinder
 - Connecting rod bend of No 1 & 4 Cylinder
10. Purpose of clutch switch used in CRDI Vehicle
- Information to ECU of vehicle running in which gear
 - For Checking of Clutch wear
 - To control RPM flaring on event of gear change or braking.
 - All the above
11. L Line, K Line and CAN are used as a mode of communication between
- Different modules
 - Sensor and ECU
 - Actuator and ECU
 - Sensor & Actuators
12. Oil pressure of a diesel engine at idle is 0.8 bar and at 2000 rpm is 1 bar, the suspected cause may be
- Oil level is more
 - Diesel Mixing with engine oil
 - Main Journal bearing worn out
 - Water Mixing with engine oil.
13. NTC Type Coolant temperature sensor can be checked by measuring the: -
- Voltage across the terminal
 - Resistance across the terminals
 - Current across the terminals
 - All the above
14. SL, CH4, CI4+ are the types of
- Coolants
 - Lubricating Oils
 - Brake Fluids
 - Automatic Transmission Oils

15. Term Oxidation and Reduction are related to which automobile component
- Condenser
 - Evaporator
 - Intercooler
 - Catalytic Converter**

For question 16 to 18 refer diagram below



16. If five amp fuse F9 is Blown off then what will happen as per this circuit
- Starter will not crank**
 - Starter will crank but will not start
 - Battery will not charge
 - Solenoid will operate but will not crank.
17. What is the voltage at Pin No 49 of ECU as per the Diagram when IGN is ON
- 5Volt
 - 12 Volt**
 - 0 Volt
 - Not sure
18. With the reference of diagram; what could be maximum current flowing through starter relay
- 12 Ampere
 - 30 Ampere**
 - 12 Volts
 - 30 Volts
19. Chose the incorrect statement with respect to Jump Starting procedure
- Connect Dead Battery Positive to Jump Start Battery Positive
 - Both the battery should be of same ampere rating
 - Connect Negative of dead battery to negative of Jump battery**
 - Jump Start Vehicle should be in Engine Start Position

20. In a CRDI Vehicle if fuel pressure is too high then Engine will
- De-rate
 - Over-rate
 - Knock and cuts off**
 - Not start
21. If Fuel Temperature sensor value is above 100 Degree centigrade then by default engine will
- Start Hunting
 - On event of Acceleration engine will cut-off**
 - Not start
 - Not have any effect
22. DTC B0148 related to
- Body system**
 - Chassis system
 - Powertrain system
 - Brake system
23. Purpose of Idle control valve In CNG & Petrol Vehicle is to
- Supply air at idle
 - Increase air supply at load
 - Increase engine RPM
 - Both a & b**
24. If the specific gravity of a battery is between 1.200 to 1.240 then battery is
- 100% charged
 - 70% charged**
 - 60% charged
 - 40% charged
25. NO_x emission cannot be reduced by
- Lowering the combustion chamber temperature
 - Using EGR valve
 - Decreasing compression ratio
 - Use of Oxidation Catcon**
26. In truck, which chassis type has all the controls mounted in front of the Engine?
- Semi Forward
 - Fully Forward**
 - Conventional
 - All the above
27. Which of the following device allows the flow of Current in one direction, but also allows reverse Current when it exceeds the designated Voltage?
- Diode
 - Zener Diode**
 - Capacitor
 - Transistor

28. Camber angle means _____
- The angle of the king pin
 - The angle between the front & Rear tires
 - Inward or outward tilt of the wheel assembly at the front
 - Backward or Forward tilt of the wheel at the top
29. Unit of capacitance is
- Ampere
 - Watt
 - Farad
 - Ohm
30. If clearance volume is increased compression ratio will
- Increase
 - Decrease
 - No change
 - Equal
31. As per the Government of India from 01st Jan 2018 what made compulsory for commercial vehicle which have a payload above 3.5 Ton.
- Antilock Brake System
 - Airbag
 - Air Conditioning
 - Immobilizer
32. Purpose of wheel speed sensor In ABS is to
- Monitor the each wheel speed.
 - Monitor the each wheel pneumatic pressure
 - Measure the vehicle speed correctly
 - Both a & b
33. Inductive sensors produces:
- Square waves
 - Sine waves
 - Triangular waves
 - Rectangular waves
34. Technician A says to check a switch measure the voltage at the input supply and the output. Technician B says to check a twin filament bulb use an ohmmeter to measure the resistance of the filaments. Who is right?
- A only
 - B only
 - Both A and B
 - Neither A nor B

35. When looking at a waveform on an oscilloscope screen, the vertical scale represents:
- a. Voltage
 - b. Time
 - c. Current
 - d. Resistance
36. CAN High is connected to DLC pins:
- a. 7 and 15
 - b. 4 and 16
 - c. 2 and 10
 - d. 6 and 14
37. The output of a closed loop system has:
- a. No effect on the input
 - b. a direct effect on the input
 - c. Input characteristics
 - d. Output tendencies
38. A relay can be thought of as a:
- a. Remote controlled switch
 - b. Magnetic resistor
 - c. Non-magnetic capacitor
 - d. Heating device
39. 12-volt lead-acid battery has:
- a. Cells connected in parallel, plates connected in series
 - b. Cells connected in series, plates connected in parallel
 - c. Cells connected in series, plates connected in series
 - d. Cells connected in parallel, plates connected in parallel
40. The duration of a high rate discharge test should not exceed more than:
- a. 10 seconds
 - b. 30 seconds
 - c. 50 seconds
 - d. 70 seconds
41. The charging voltage of an engine running at approximately 3000 rev/min should be:
- a. 12.6 volts
 - b. 14.2 volts
 - c. More than 14.2 Volts
 - d. Less than 14.2 Volts
42. The function of the Zener diode in the electronic control unit of an alternator is to act as a:
- a. Current amplifier
 - b. Voltage amplifier
 - c. Voltage regulator
 - d. Current regulator

43. The purpose of the pull-in winding in the operating solenoid of a pre-engaged starter motor is to:
- hold the pinion in mesh
 - pull the pinion out of mesh
 - hold the pinion out of mesh
 - pull the pinion into mesh
44. The effect of a planetary gear set fitted between the motor and drive pinion of starter motor is
- Modifies the speed characteristics only
 - Modifies the torque characteristics only
 - Modifies the speed and torque characteristics
 - Has no effect on the speed or torque characteristics
45. Setting spark plug gaps too wide will cause running problems because the firing voltage will:
- Increase and the spark duration will decrease
 - Increase and the spark duration will increase
 - Decrease and the spark duration will increase
 - Decrease and the spark duration will decrease
46. Changes in pressure to a MAP sensor converted to:
- Variable voltage output
 - Variable current output
 - Constant voltage output
 - Steady current reading
47. The ideal ratio of air to fuel which ensures complete and clean combustion is:
- 14.7 : 1 by weight
 - 1:14.7 by weight
 - 14.7 : 1 by volume
 - 1 : 14.7 by volume
48. On an petrol engine fitted with Electronic Fuel Injection, engine load may be determined by using a:
- MAP sensor
 - Throttle position sensor
 - Lambda sensor
 - Vacuum capsule
49. The type of petrol injection system which makes use of a single injector that sprays fuel towards a throttle is termed as:
- Single point system
 - Rotary system
 - Multi-point system
 - In-line system

50. Increased nitrogen oxides are formed when combustion temperature is:
- High
 - Low
 - Medium
 - Constant
51. The function of a lambda sensor fitted in an exhaust system is to monitor level of :
- Carbon monoxide
 - Oxides of nitrogen
 - Carbon dioxide
 - Oxygen
52. Technician A says reduction in CO, NO_x and HC has been achieved by reducing lead in fuel. Technician B says reduction in CO, NO_x and HC has been achieved by using engine management systems. Who is right?
- A only
 - B only
 - Both A and B
 - Neither A nor B
53. A throttle potentiometer provides information relating to:
- Throttle position and engine load
 - Throttle position and driver intention
 - Idle position and engine load
 - Idle position and driver intention
54. A catalytic converter is fitted close to the exhaust manifold because:
- It is the furthest point from the expansion box
 - It is protected from vibration
 - Exhaust heat aids chemical reactions
 - Exhaust gas speed is low at this point
55. Reason for higher Exhaust emissions during engine cold starting:
- The temperature of the catalyst is low
 - The catalyst is faulty
 - Combustion temperature is always higher after start-up
 - Compression pressures are higher after start-up
56. In a conventional incandescent bulb the filament is made from:
- Halogen
 - Tungsten
 - Quartz
 - Non-resistive wire

57. A vehicle horn produces sound because a tone disc is made to vibrate by:
- Electrostatics
 - Electroplating
 - Electrocuting
 - Electromagnetism**
58. When checking an NTC type temperature sensor, Technician A says resistance increases as temperature increases. Technician B says resistance decreases as temperature increases. Who is right?
- Technician A
 - Technician B**
 - Both A and B
 - Neither A nor B
59. An oscilloscope connected to a wheel speed sensor should show a:
- Sine wave pattern**
 - Cosine wave pattern
 - Square wave pattern
 - Triangular wave pattern
60. In order for a radio to interrupt listening and broadcast traffic announcements it will receive signals described as:
- AM
 - RDS**
 - CD
 - PC
61. To prevent the risk of accidental deployment of an airbag during servicing :
- Remove the Airbag fuse and wait 10 minutes**
 - Remove the Airbag fuse and discharge the capacitors manually
 - Wait 10 seconds and remove the SRS fuse
 - Wait 10 seconds and discharge the capacitors manually
62. Causes of Shimmy Steering
- Wheel bearings improperly adjusted**
 - Tyre pressure low
 - Steering gear control valve sleeve sticking
 - Looseness in rear axle assembly on trailer bogies
63. Steering wheel not returning automatically after taking turn
- Wheels or brake drums out of balance
 - Front Wheel alignment incorrect**
 - Badly worn or unevenly worn Tyre
 - Wheel bearings improperly adjusted or worn

64. Type of grease used in propeller shaft centre support bearing
- a. High Melting grease
 - b. Petroleum Jelly
 - c. Water Proof grease
 - d. None of the above
65. In kneeling system rear air spring air is released through
- a. Relay valve
 - b. Levelling valve
 - c. Non-return valve
 - d. Filter

The Test will be created and given at site. Each participant will be checked on the practical

Practical - 01

Customer Concern: Low pickup



 Learn.Deliver

Section – C

C. 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.

Measurement is used to assess accuracy, precision, and other performance which can be measured in unambiguous way. Mark is awarded in full for a dimension with in tolerance and zero when it is out of tolerance.

Judgment is used to assess the quality of performance, about which there may be small differences of opinion.

In this Skill Project Competition all assessment is done by adopting Measurement

<u>PRACTICAL-1-</u>									
<u>Measurment</u>									
<u>Poor Pickup</u>									
SI No	Activity	Marks allocated	Candidates						
				Remarks		Remarks		Remarks	
1	Adherence to safety practices	6							
2	Verify the concern by starting the engine.	1							
3	Retrieving of DTC	3							
4	Retrieving of Data Display	2							
5	Referring the service	6							

	Manual/wiring diagram for procedure								
6	Diagnosing root cause	9							
7	Speed of performing the activity	3							
Total		30							
Viva									
SI No	Activity	Marks allocated	Candidates						
			Remarks	Remarks	Remarks	Remarks			
1	What is the purpose of MAF sensor?	2							
2	What happens if MAF sensor is faulty?	2							
3	Explanation wiring diagram	2							
4	Why Engine Management system	2							
5	Awareness about various modules like BCM,ABS,SRS etc.	2							
Total		10							
Total Marks Scored		40							

Section - D

D. Infrastructure List

Practical_01 - PowerPoint

M HARISHCHANDRAKAR [CVBU, Sales, Marketing, After Sales, Thane]

Tools and equipment required on workstation.

Sl. No.	Aggregates / Tools/Vehicle
1	Vehicle
2	Diagnostic tool
3	Service Manual for the participants to guiding for <u>diagnosing</u>
4	Multimeter
5	Basic tools

Learn. Deliver

Slide 2 of 5 English (India) 17:21 12-12-2017

Practical_01 - PowerPoint

M HARISHCHANDRAKAR [CVBU, Sales, Marketing, After Sales, Thane]

How to create the problem?

Disconnect MAF sensor connector from the MAF sensor.

Pull out sensor signal pin and insert the dummy pin in the same slot. Cover both dummy pin end and removed pin with insulation tape. Roll back the black sleeve on the wires and reconnect the Sensor connector to sensor.

Note - Confirm DTC P0103 is set in ECM

Learn. Deliver

Slide 3 of 5 English (India) 17:21 12-12-2017

Practical_01 - PowerPoint

M HARISHCHANDRAKAR [CVBU, Sales, Marketing, After Sales, Thane]

File Home Insert Design Transitions Animations Slide Show Review View Tell me what you want to do...

Clipboard Paste New Slide Layout Reset Section Slides Font Paragraph Drawing Editing

2

3

4

5

Slide 4 of 5 English (India)

Search the web and Windows

17:21 12-12-2017

Judge verbatim regarding the concern on the vehicle

“Poor pick”

Note – Create the problem mentioned in above slides along with any DTC. Judge should inform the participants that the concern is “Poor Pick up and need not to mention about MIL’

Learn. Deliver

Practical_01 - PowerPoint

M HARISHCHANDRAKAR [CVBU, Sales, Marketing, After Sales, Thane]

File Home Insert Design Transitions Animations Slide Show Review View Tell me what you want to do...

Clipboard Paste New Slide Layout Reset Section Slides Font Paragraph Drawing Editing

3

4

5

Slide 5 of 5 English (India)

Search the web and Windows

17:22 12-12-2017

Participant should perform the below steps with the help of available equipment and Service Manual

- Verify the concern by starting the engine.
- Check for MIL glowing in cluster meter.
- Check Vehicle DTC and for conformation need check Sensor parameter.
- Switch off the ignition. Disconnect AMF for any damage. Ensure proper fitment of sensor connector.
- Service Manual Usage
- Check for voltage and ground at particular reference, signal and ground circuit.
- Check continuity / less than 5 Ω of resistance between sensor and ECM connector.
- Participant should conclude that the circuit is open between sensor signal connector and ECM connector.

Learn. Deliver

Section – E

E. Instructions for candidates

1. Maximum working time is one hour for theory and two hours for practical
2. Supplied equipment and materials should be checked by the competitor to ensure is satisfactory, prior to starting the task.
3. Competitors will lose marks for any damage caused to equipment or components where it is a result of competitor error.
4. Competitors will lose marks for non-compliance with health and safety rules and regulations and may be stopped from proceeding if they put themselves or others at risk of injury or risk damage to vehicles, tools or equipment.
5. Competitors are also assessed on efficient use of materials and will lose marks for excessive wastage

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 to include Boiler Suit, safety Shoes, Goggles and knitted Gloves.
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.