WORKFORCE DEVELOPMENT AUTHORITY
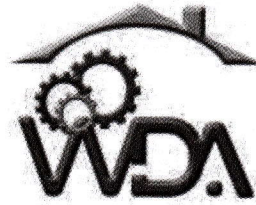
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ADVANCED LEVEL NATIONAL EXAMINATIONS, 2015, TECHNICAL AND PROFESSIONAL TRADES

EXAM TITLE: Knowledge of Materials and
Automotive Technology

OPTION: Motor Vehicle Mechanics (MVM)

DURATION: 3hours

INSTRUCTIONS:

The paper is composed of **three (3) Sections**:

Section **I**: Eighteen **(18)** questions, all **Compulsory**. **55marks**

Section **II**: Five (5) questions, **Choose Three (3) only**. **30marks**

Section **III**: Three (3) questions, **Choose only One (1)**. **15marks**

Every candidate is required to strictly obey the above instructions. Punishment measures will be applied to anyone who ignores these instructions.

Section I. Eighteen (18) Compulsory questions.   55marks

01. Explain briefly the purpose of compression rings of pistons.   **3marks**

02. Explain why some manufacturers use a Dual-coil spring in the valve closing system.   **2marks**

03. What is proper tool for tithing the cylinder head?   **1mark**

04. List any ten (10) parts or components of a modern Automobile engine.   **5marks**

05. List five (5) causes of too much rich or lean mixture.   **5marks**

06. From which materials the crankshaft is made?   **3marks**

07. A six cylinder engine has a bore of 70mm and stroke of 80mm; if clearance volume of one cylinder is 42000mm^3. Calculate:

   (a) Compression ratio,

   (b) Capacity of an engine.   **4marks**

08. What do you understand by oil additives?   **1mark**

09. Give at least four (4) functions of additives.   **4marks**

10. Identify two (2) common types of valve guide used in thermal engine.   **2marks**

11. What is the function of the Relief valve (By-pass valve) in the lubricating system?   **4marks**

12. Differentiate dry cylinder sleeve from wet cylinder sleeve.   **5marks**

13. Name three (3) types of cast iron that you know.   **3marks**

14. What are the forms of metal crystals?   **3marks**

15. What are the six (6) properties that are required for a piston material?**3marks**

16. List three (3) methods for checking fuel pump on gasoline engine.   **3marks**

17. List down two (2) components of fuel injection system used on diesel engine.   **2marks**

18. Give two (2) types of diesel engine.   **2marks**

Section II. Answer any three (3) questions of your choice
(Do not choose more than <u>three questions</u>).   30marks

19. **a)** Name some of the troubles which usually occur in the cooling system of an engine;

   b) Explain the working of thermostat.   **10marks**

20. a) By what can the corrosion of a material be influenced?

b) Name four (4) technological properties of material.

c) Explain the term "composite material"   **10marks**

21. a) Explain what is phasing and what is calibration of injector pumps?

b) To what degree of accuracy must the following operations be carried out?

                                                                             10marks

22. a) The excellent performance of modern IC engines is largely due to great amount of research work done on combustion chamber designs. Summarize eight desirable characteristics of a good combustion chamber.

b) There are two main functions of a valve in engine. What are these functions?   **10marks**

23. a) What are the potential consequences of an inadequate seal between the cylinder head and the cylinder block?

b) Explain the points must be observed when the cylinder-head gasket is replaced.   **10marks**

Section III. Answer any one (1) question of your choice

(Do not choose more than <u>one question</u>).   **15marks**

24. Explain how you perform:

a) The compression pressure test for Petrol engine;

b) The compression-loss test for the same engine.   **15marks**

25. Name the possible causes of a diesel engine:

a) diesel engine cranks normally but will not start;

b) Diesel engine has loss of power;

c) Diesel engine has idle okay but misfires as throttle opens.   **15marks**

26. a) A 4-stroke 4-cylinder SI engine running at 4000 rpm develops 100kW. The brake thermal efficiency is 28% and the heating value of fuel is 40MJ/kg. The A/F ratio is 15:1, cylinder diameter = stroke length = 110 mm. Estimate the volumetric efficiency and the mean piston speed.

b) What do the terms of T.D.C and B.D.C stand for?   **15marks**

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