

## **AUTO MECHANICAL WORK**

### **EXAMINATION SCHEME**

There will be three papers, Papers 1, 2 and 3 all of which must be taken. Papers 1 and 2 shall be a composite paper to be taken at one sitting.

Paper 1: will consist of forty multiple-choice objective questions all of which are to be answered in 45 minutes for 40 marks.

Paper 2: will consist of two sections, Sections A and B to be answered in 2 hours 15 minutes for 80 marks.

Section A: will consist of ten short-structured questions to be answered in 30 minutes for 20 marks.

Section B: will consist of five essay questions. Candidates will be required to answer any four in 1 hour 45 minutes for 60 marks.

Paper 3: will be a practical test of 2 hours 30 minutes duration. It will consist of two compulsory questions for 80 marks.

A list of materials shall be made available to schools not less than two weeks before the paper is taken for material procurement and relevant preparation.

#### (Alternative to Practical Test)

Alternatively, in the event that materials for the actual practical test cannot be acquired, the Council may consider testing theoretically, candidates' level of acquisition of the practical skills prescribed in the syllabus. For this alternative test, there will be two sets of compulsory questions to be answered in 1½ hours for 80 marks.

### **DETAILED SYLLABUS**

<b>S/NO.</b>	<b>TOPICS</b>	<b>NOTES</b>
1	Workshop safety and regulations	<ul style="list-style-type: none"><li>- Define safety and regulation</li><li>- Causes of workshop accidents</li><li>- Accident prevention techniques and safety devices e.g. sand bucket, fire extinguishers, etc.</li></ul>
2	Tools and equipment	<ul style="list-style-type: none"><li>- Types and uses of tools e.g. marking, measuring, holding and cutting tools.</li><li>- Types and uses of equipment e.g. hand valve, grinding tool etc.</li><li>- maintenance of tools and equipment.</li></ul>

3	Vehicle layout	<ul style="list-style-type: none"> <li>- Types of motor vehicle chassis</li> <li>- Principal components, identification and functions (e.g. engine, transmission system, chassis, etc)</li> <li>- Chassis maintenance.</li> </ul>
4	Automobile Engine	<ul style="list-style-type: none"> <li>- Types of engine design.</li> <li>- Identification of main component of an engine.</li> <li>- Line diagram of multicylinder engine.</li> <li>- Types of cylinder liners.</li> <li>- Two stroke and four stroke cycles. (spark ignition engine and compression ignition engine).</li> <li>- Advantages of four stroke cycle over two stroke cycle engine.</li> <li>- Engine maintenance and servicing.</li> </ul>
5	Transmission system	<ul style="list-style-type: none"> <li>- Transmission system layout.</li> <li>- Types of drives.</li> <li>- Components of transmission system e.g clutch and gear box etc.</li> <li>- Operation of simple plate clutch.</li> <li>- Types and operation of gear box.</li> <li>- Introduction to automatic transmission system.</li> <li>- Conventional layout of transmission system.</li> </ul>
6	Suspension system	<ul style="list-style-type: none"> <li>- Types and functions of suspension systems.</li> <li>- Fault finding, maintenance and repair of suspension system.</li> </ul>
<b>S/NO.</b>	<b>TOPICS</b>	<b>NOTES</b>
7	Steering system	<ul style="list-style-type: none"> <li>- Components and functions of steering system.</li> <li>- Types of steering gearbox.</li> <li>- Manual steering fault and repairs</li> <li>- Operation of power assisted steering.</li> <li>- Steering geometry</li> </ul>
8	Engine lubrication system	<ul style="list-style-type: none"> <li>- Purpose and types of lubrication system.</li> <li>- Friction and its disadvantages.</li> <li>- Component part of lubrication system.</li> <li>- Quality and viscosity of lubricants.</li> <li>- Oil additive and its importance</li> </ul>
9	Cooling system	<ul style="list-style-type: none"> <li>- Function and types of cooling system</li> <li>- Components of water and air cooling systems.</li> <li>- Comparison of air and water cooling systems.</li> </ul>
	Fuels and combustion	<ul style="list-style-type: none"> <li>- General layout and working principle of the fuel supply system.</li> </ul>

10	(a) Fuel component system  (b) Manifold and air cleaner	<ul style="list-style-type: none"> <li>- Component parts and function of the fuel supply system.</li> <li>- Types of carburetors, pumps and their maintenance</li> <li>- Types and properties of fuel.</li> <li>- Comparison of mechanical and electrical fuel pumps.</li> </ul> Types, functions and maintenance of: (i) Manifold (ii) Air cleaner (iii) Muffler
11	Braking system	<ul style="list-style-type: none"> <li>- Concept of friction, operating principles and types of braking systems.</li> <li>- Faults and maintenance of mechanical and hydraulically operated braking systems.</li> <li>- Functions, advantages and disadvantages of antilock braking system (A.B.S).</li> <li>- Layout of braking system.</li> </ul>
12	Wheels and Tyres	<ul style="list-style-type: none"> <li>- Types and functions of rims and tyres.</li> <li>- Vulcanizing</li> <li>- Stating regulation for tyre inter changing and pressure.</li> <li>- Road wheels alignment and balancing.</li> </ul>
<b>S/NO</b>	<b>TOPICS</b>	<b>NOTE</b>
13	Workshop management and enterprise	<ul style="list-style-type: none"> <li>- Basic concept of:                (i) management                (ii) planning                (iii) controlling                (iv) staffing                (v) directing</li> <li>- Managing resources</li> <li>- Concept of authority and responsibilities in enterprising.</li> <li>- Types of enterprise.</li> <li>- Advantages and disadvantages of types of enterprise in automobile.</li> </ul>

**7. LIST OF FACILITIES AND MAJOR EQUIPMENT/MATERIALS REQUIRED:**

<b>ITEM NO.</b>	<b>EQUIPMENT</b>	<b>QUANTITY REQUIRED</b>
1	Tool box with lock	5
2	Ball peen hammer	5
3	Hacksaws with extra blades	10
4	300 mm engineer's rule, socket, spanner sets, with ratchet and extension	10
5	6-32mm ring and flat spanners (combined)	5
6	Ring spanners (6-32mm)	5
7	Emery cloth (standard)	5
8	Plug spanners	5
9	Flat spanners (6-32mm)	10
10	Allen keys	5
11	Feeler gauges	5
12	Oil cans	5
13	Grease guns	3
14	Spark plug cleaners	2
15	Combination pliers	5
16	Long nose pliers	5
17	Wire cutter	5
	<b>Measuring tools</b>	
18	Tyre pressure gauges	5
19	Vernier caliper	5
20	Surface gauges	5
21	Surface plates	1
22	Vee blocks	6
23	Micrometer screw gauge	5
24	Dial gauge indicator with magnetic stand	2
	<b>Machine tools</b>	
25	Grinding machine with assorted wheels	1
26	Bench grinder with wheels	1
27	Valve grinding machine	1
	<b>Joining Metals</b>	
28	Blow lamps	3
29	Soldering iron	5
	<b>Lubrication Bay/Tyre and Wheel Service</b>	
30	Compressor (single phase motor driven type complete with spray gun, grease, hose)	1
31	Wheel balancing machine (rim 13 – 15)	1
32	Portable tyre inflator	1

33	Master vulcanizer	1
34	Tyre changer complete with bead breaker	1
35	Tyre repair kit comprising rasp, scissors, tyre knife, sticher, wire brush, etc	2 sets
36	Service station set of tool kit, plus special tools for removal of oil filter	2 sets
37	Pipe wrench, clamp/vice	2 sets
38	Wheel alignment gauge	1 set
39	Clutch alignment jig	2
40	Injector test machine	1
41	Pullers of different sizes	2
42	Work bench with vices	2
43	Portable engine hoist	1
	<b>General/Servicing and reconditioning</b>	
44	Bottle jack (hydraulic) light and heavy	1
45	Used vehicle tyres	1
46	Trolley jacks	2
47	Timing light	1
48	Inspection pits	1
49	Compression gauge	2
50	Valve spring compressor (clamp)	2
51	Coil spring compressor (for suspension)	2
52	Torque wrench pre-set type	2
53	Torque wrench dial type	2
	<b>Tools/Equipment</b>	
54	Piston ring compressor expander	2
55	Axle stands	5
56	Diagnostic testing machine (exhaust gas analyzer)	1
	<b>Other utilities</b>	
57	Fire extinguisher	5
58	Sand buckets	5
59	Water buckets	5
60	Complete engine, gearbox and final drive	1
61	Workshop overalls	25
62	Complete vehicle engine (petrol) (chart)	1
63	Complete vehicle engine (diesel) (chart)	1
64	Complete vehicle and chart	1

## SUGGESTED READING LIST

S/N	TITTLE	AUTHOR
1	Motor Vehicle Technology	J.A.DOLAN
2	Motor Vehicle Technology (Part 1,2,3 & 4)	S.C .MUDD
3	Automotive Mechanics	WILLIAM H.CROUSE and DONALD L. ANGLIN
4	Fundamental of Motor Vehicle Technology	V.A.W HILLIER and PETER COOMBES
5	Automotive Mechanics For Schools and Colleges	ABA .N.EJEMBI and STEPHEN DAVID
6	The Automobile	HARBANS SINGH REYAT