GENERAL ENGLISH

General English Paper - I		:	100 Marks
a)	Essay Writing (Conventional)	:	15 Marks
b)	Precis Writing (Conventional)	:	10 Marks
c)	Letter Writing (Conventional)	:	10 Marks
d)	Idioms & Phrases (Conventional)	:	10 Marks
e)	Expansion of passages (Conventional)	:	10 Marks
f)	Comprehension of given passages (Conventional)	:	10 Marks
g)	Grammar : (Objective type)	:	10 Marks
	Parts of Speech : Nouns, Adjective, Verb, Adverb, Preposition etc.		
h)	Composition (Objective type)	:	15 Marks
	i) Analysis of Complex and compound sentences ii) Transformation of Sentences iii) Synthetics of sentences		
i)	Correct usage and vocabularies (Objecttive type)	:	10 Marks

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AUTOMOBILE ENGINEERING
PAPER - I (150 MARKS)

1.0 INTRODUCTION :- 20 marks

1.1. Definition of automobile

1.2 Units of automobile-body: floor assembly, panels, bonnet assembly, roof assembly, year tank lid, quarter panels, front side assembly, engine hood, bumpers, doors; chassis : frame, power unit, power train, running system.

1.3 Different types of chassis layouts
- front engine driving the rear wheels, transverse engine driving the front wheels, rear engine driving the rear wheels, four wheel drive.

1.4 Classification of vehicles according to the following criteria - requirement, load carrying capacity, type of body, type of derive, number of wheels, fuel used, number of seats, model and make ,total piston displacement volume, type of control, number of doors, position of engine.

1.5 Garage tools and equipment - basic tool kit and additional tools for a mechanic.

2.0 ENGINE :- 44 marks

2.1 Classification of internal combustion engine reciprocating :
Compression ignition, spark ignition, wankel, rotary.

2.2 Classification of reciprocating engines on following criteria - type of cycle, number of cylinder, type of fuel used, arrangement of cylinder, arrangement of valves, arrangement of camshaft, engine speed, method of cooling.

2.3 Theoretical heat cycles - otto cycle, diesel cycle, mixed cycle.

2.4 Petrol engine - working principle and application of four stroke petrol engine.

2.5 Diesel engine - working principle and application of four stroke engine and two stroke engine.

2.6 Combustion - exhaust emissions : hydrocarbons, carbon monoxide, oxides of nitrogen; emission control approaches : modification of engine design, modification of fuel, exhaust gas treatment; detonation, pre-ignition, valve timing diagram.

2.7 Engine performance and its measurement - bore and stroke, swept volume and clearance volume, compression ration; engine torque; mean effective pressure; horse power: BHP, IHP, FHP; engine efficiencies : air standard, mechanical, thermal, indicated thermal, broke thermal, volumetric; specific fuel consumption;
performance curves: torque versus engine speed, BHP versus RPM, FHP versus RPM, specific fuel consumption versus RPM.

3.0 POWER TRAIN :- 40 marks

3.1 Transmission- Elements of power transmission from crank shaft to rear axle.

3.2 Clutch- functions of clutch, working principles of different types of clutch: cone, inverted cone, single plate, multiplate, diaphragm, automotic.

3.3 Gear boxed- construction and working principles of different types of gear boxes: sliding, constant mesh, syncromesh, epicycle, automatic; gear box lubrication.
3.4 Propeller shaft- functions, construction.
3.5 Universal joints- working principles of different types of universal joints.
3.6 Differential - purpose, principle, construction.
3.7 Drive systems- front wheel drive, four wheel drive.
3.8 Rear axles - forces on near axles.
3.9 Live axles: semi-floating, three-quarter floating, fully floating.
3.10 Front axles - steering heads
3.11 Power take-off shaft
3.12 Dead front axle

4.0 **SUSPENSION SYSTEMS :- 20 marks**

4.1 Functions of suspension system and characteristics of a good suspension system and characteristics.
4.2 Working principles of different suspension systems:
conventinal independent front or rear, air hydroelastic.
4.3 Working principle of different types of suspension springs: leaf, coil torsion, air, rubber, hydroelastic.
4.4 Dampers- purpose, function, types.
4.5 Working principles suspensions- air, hydrogas, hydroelastic.

5.0 **STEERING SYSTEMS :- 26 marks**

5.1 Functions and requirements of a steering system.
5.2 Steering mechanisms: Ackerman.
5.3 Definition over-steer and under-steer
5.4 Arrangement of steering system
- steering wheel, steering column, steering shaft, drop arm, drag link.
5.5 Types of steering gears- worm and sector, rack and pinion, reciprocating ball, warm and roller, cam and lever, screw and nut.
5.6 Definition of reversibility.
5.7 Power steering- advantages and principle of working
5.8 Concepts on turning radius, steering ration, centre point steering.
5.9 Wheel alignment: camber, caster, king pin inclination, toe-in, toe-out drawing turns, wheel alignment-setting.

AUTOMOBILE ENGINEERING
PAPER -II (150 MARKS)

1.0 FUEL SYSTEM :-40 marks

1.1 Characteristics of fuels for automobile engines.
1.2 Requirements of a good fuel-octane rating, cetance rating, sulphur content, gum content.
1.3 Carburation and air fuel ratios
- factors affecting carburation : temperature, time, quality, engine design; air fuel ratios.
1.4 Simple carburettor and its limitations - functions of carburettor, principle of operation, construction and working of simple carburettor, limitations.
1.5 Modern carburetor system- float, starting idle and low speed, high speed, accelerating.
1.6 Working principle of difficult types of carburettors - fixed choke and variable pressure type, variable choke and constant pressure type, updraft, down draft, side draft, zenith carburettor, solex carburettor, su-carburettor.
1.7 Fuel supply system-petrol engines: tank, fuel, lines, filters mechanical fuel pump, electric fuel pump, petrol injection system; diesel engines: methods of fuel injection, injector types, fuel injection pump, primary and secondary fuel filters.
1.8 Supercharging of I.C. engines; Governing system; mechanical, pneumatic and hydraulic.

2.0 COOLING SYSTEM : 16 marks

2.1 Comparison among different types of cooling systems:
water cooling, air cooling.
2.2 Parts of air cooling and water cooling systems.
3.3 Anti-freeze mixtures-characteristics and examples

3.0 LUBRICATION SYSTEM : 20 marks

3.1 Purpose of lubrication and parts of engine that require lubrication.
3.2 Lubricating oil-function of lubricating oil, properties of lubricating oil.
3.3 Principles of different types of lubrication system-
petrol, splash, semi-pressure, pressure, wet-sump, dry sump.
3.4 Parts of lubrication system- oil sump, oil pump, oil relief valve, oil filter, oil dip stick, oil pressure indicating light, oil pressure gauge.

4.0 WHEELS : 14 MARKS

4.1 Types of wheels and requirements of road wheels, types of commercial vehicle wheels.
4.2 Rims-types of rims
4.3 Tyres-description of different types of tyres, tyre specivication, factors affecting tyre life.

5.0 BRAKING SYSTEM : 24 MARKS

5.1 Principle of broking and requirements of brake
5.2 Construction and working principle of different types of brakes - drum brakes, disc brakes, mechanical brakes, complressed air brakes, air hydraulic brakes

6.0 CHASSIS AND BODY : 16 MARKS

6.1 Functions of chassis frame; types of chassis frames : conventional frame, integral construction.
6.2 Different types of frames: car frame, truck frame, tubular frame, sub frame.
6.3 Body requirements and types.

7.0 ELECTRICAL SYSTEMS : 20 MARKS

7.1 Battery-types, principle of battery charging, capacity, methods of charging.
7.2 Dynamo and alternator-purpose, parts, principle of working.
7.3 Ignition system-parts of ignition circuit, magneto ignition system.
7.4 Starting system- purpose, circuit, construction.
7.5 Lighting and auxiliary equipment - Lighting circuit, components of lighting system, components operated by electricity, head lamp, electric horn wind screen wiper.

MECHANICAL ENGINEERING
PAPER - I (150 MARKS)

1.0 AUTOMOBILE ENGINE - 24

1.1 Classification of I.C Engine
1.2 Working principle & application of 4-stroke & 2 stroke Petrol Engine
1.3 Working principle & application of 4-stroke Diesel engine
1.4 Engine performance & its measurement

2.0 MECHANICAL MEASUREMENTS - 16

2.2 Classification of measuring instruments
2.3 Types of measuring instruments
2.4 Classification of gauges
2.5 Types of gauges

3.0 MACHINE TOOLS - 20

3.1 Milling machine
3.2 Boring machine
3.3 Grinding machine
3.4 Gear hobbing machine
3.5 Capstan & Turret Lathe

4.0 FUEL SYSTEM IN AUTOMOBILE - 16

4.1 Characteristics of fuels
4.2 Requirement of good fuel-Octane rating, Cetane rating, sulphur content etc
4.3 Fuel Supply System in Diesel & Petrol Engine
4.4 Supercharging of I.C Engine

5.0 MANUFACTURING PROCESS - 24

5.1 Introduction to mettallurgy
5.2 Heat treatment of steel
5.3 Brazing, Braze welding & soldering
5.4 Gas welding & cutting
5.5 Electric welding

MECHANICAL ENGINEERING
PAPER - II (FULL MARKS - 150)

1.0 THEORY OF MACHINES - 20

1.1 Mechanism
1.2 Belt, Rope & Chain drive
1.3 Gear drive
1.4 Balancing & Vibration
1.5 Gyroscope

2.0 BRAKING SYSTEM - **16**

2.1 Principle & requirement of brake in automobile
2.2 Different types of brakes

3.0 PRODUCTION MANAGEMENT - **20**

3.1 Plant location, layout & material handling
3.2 Production planning & control
3.3 Inspection & quality control
3.4 Materials management & inventory control

4.0 CHASSIS & BODY - **14**

4.1 Functions of chassis frame
4.2 Types of chassis frames
4.3 Construction of chassis & body

5.0 SUSPENSION SYSTEM - **16**

5.2 Purposr of suspension system
5.2 Characteristics of good suspension system
5.3 Types of suspension system
5.4 Dampers - Purpose, friction, types.

6.0 STEERING SYSTEM - **20**

6.1 Purpose of steering system
6.2 Fifth wheel steering system
6.3 Ackerman steering system
6.4 Parts of steering system
6.5 Types of steering gears
6.6 Definition of reversibility
6.7 Power steering -Principle of working & advantages
6.8 Concepts on turning radius, steering ratio, centre point steering
6.9 Allignment of wheel

7.0 ELECTRICAL SYSTEM - 20

7.1 Types of battery, method & principle of battery charging
7.2 Dynamo & Alternator - Purpose, parts, principle of working
7.3 Ignition system
7.4 Starting system
7.5 Lighting & auxiliary equipments

8.0 TRANSMISSION SYSTEM - 24

8.1 Clutch-Functions, types & working principles of different types of clutch
8.2 Gear boxes-Functions, types & working principles
8.3 Constructions & functions of propeller shafts
8.4 Working principles of different types of universal joints
8.5 Differential-Purpose, principles, construction
8.6 Drive system - Front wheel drive, Four wheel drive