7) MECHANICAL SCIENCE

i) AUTOMOBILE ENGINEERING
Syllabus & Model Question Paper

PART - B

AUTOMOBILE ENGINEERING

Introduction, 2 Stroke and 4 Stroke Engines, Engine Components, Carbonation , Petrol and Diesel Fuel Injection, Combustion in S.I & C.I Engines , Engine Cooling.

Automotive Electrical & Electronics: Storage Batteries , Ignition System, Starter Motor, Charging System

Vehicle Dynamics: Undamped and Damped vibrations, Forced Vibrations, Vehicle Vibrations on Human Comfort

Automotive Component Design: Power for Propulsion, Design of I.C Engine Parts and Gear Box.

Metrology And Measuremtns: Limits, Fits & tolerances, types of gauges, comparators, Surface finish equipments, pressure, flow and strain measurement

CAD/ CAM: Product Cycle, Elements of CAD/CAM system–Hardware and Software, modeling, Transformations, NC, CNC, Robots Configurations and Applications, Programming Language, Robotic Sensors.

PART – B
(AUTOMOBILE ENGINEERING)

SECTION – I OF PART – B
Each question carries One Marks   **20 x 1 = 20 Marks**

1) I - section of connecting rod is generally preferred for
   a) slow speed engine   c) high speed engine
   b) low horse power engine   d) steam engine

2) The fuel injection timing in a distributor type pump is controlled by
   a) changing plunger stroke
   b) changing speed of rotor
   c) rotating the cam ring
   d) changing the number of cams on the ring

3) To check the diameter a twist drill with a micrometer, the measurement must be taken across the
   a) margin of the drill   b) flutes of the drill
   c) lips of the drill   d) web of the drill

4) Which code represents canned cycle number for drilling
   a) G80   c) G81
   b) G82   d) G83

5) Ratio of two successive oscillations in an underdamped system is
   a) linear   c) logarithmic
   b) constant   d) exponential

2

Each question carries two Marks   **10 x 2 = 20 Marks**

1) The bore and stroke of a 4-cylinder petrol Fiat car engine are 6.85cm and 7.5cm respectively. The compression ratio is 8.2.\ Find clearness volume.

a)38.4cm^3 c)28.4cm^3

b)30.4cm^3 d)48.4cm^3

2) The road resistance for a car is 23 Kg/tones, and air resistance is given by the expression 0.00843y^2 .What is the BHP required for a top speed of 144Km/hr if the car weighs 2.032 tones and transmission efficiency in top gear is 88%

a) 130.5 HP   b) 134.5 HP

c) 131.5 HP   d) 132.5HP

3) In a gear box the clutch shaft pinion has 14 teeth and low gear main shaft pinion 32 teeth. The corresponding lay shaft pinions have 36 and 18 teeth. The rear axle ratio is 37: 1 and the effective radius of the tyre is 0.355 m. what is the car speed in the above arrangement at an engine speed of 2500 rpm.

a)19.8 km/hr   c) 18.8 kmIhr

b)20.8 km/hr   d) 17.8 km/hr

4) An instrument vibrates with frequency of 1 Hz when there is no damping. When the Damping is provided the frequency of damped vibration was observed to the 0.9Hz. The damping factor is

a) 0.236   c) 0.636

b) 0.936   d) 0.434

5) A mass of 1 kg is attached to the end of a spring with a stiffness 0.7 *N/mm.* The critical damping coefficient of this system will be

a) 1.40 *Ns/m*   c) 52.92 *Ns/m*

b) 18.522 *Ns/m*   d) 529.2 Ns/m

ii) INDUSTRIAL ENGINEERING AND MANAGEMENT
Syllabus & Model Question Paper

PART - B

Work Study and Ergonomics- Productivity, Work Study, Method Study, Ergonomics.

Quality Management – Statistical Process Control, Control Charts, Inspection and Test – Sampling Plans

Industrial Management – Introduction, Management Function, Motivation and Behavior

MIS- Fundamentals, Business Application, Issues in Management Information Technology

DBMS- Introduction, Concepts and Architecture and Data Modeling

OR – LPP, Transportation, Assignment Problems, Inventory Control, PERT - CPM

Materials Management- Introduction, Purchasing, Stores: Inventory: Supply Chain Managements

CAD/ CAM

Product Cycle, Elements of CAD/CAM system – Hardware and Software, modeling, Transformations, NC, CNC, Robots Configurations and Applications, Programming Language, Robotic Sensors.

Metrology: Limits, fits, Tolerances, Gauges, Comparators, Surface Finish Measurements

PART - B

(INDUSTRIAL ENGINEERING AND MANAGEMENT)

SECTION – I OF PART – B

<u>Each question carries One Marks</u>   **20 x 1 = 20 Marks**

1) The number of Therblig symbols are:

    (a) 20   (b) 15   (c) 18   (d) 16

2 A Database holds
    a) Processed and organized data
    b) Conceptual, mathematical and logical order models
    c) Knowledge in variety of forms
    d) none of the above

3) In PERT, the distribution of activity time is assumed to be
   a) Normal distribution
   b) Beta distribution
   c) Binomial distribution
   d) Gamma distribution

4) The M-system and E-system in metrology are related with measurement of
   (a) Gears
   (b) Screw threads
   (c) Flatness
   (d) Surface finish

5) The Optimality of a transportation problem is determined by the application of
   (a) North West corner rule method
   (b) Vogels approximation method

   (c) Modi method
   (d) None of the above

SECTION – II OF PART - B

Each question carries two marks   **10 x 2 = 20 Marks**

1) If the selected time for an element is 2 min per piece and the performance rating of the operator is 120 and 10 % personal allowances is provided, the standard time per piece is
   a) 2.6 min   b) 2 min   c) 2.64 min   d) 2.66min

2) In PERT activity has an optimistic time of 8 days, pessimistic time of 12 days and the most likely time is 10days ,the expected time of the activity would be:
   (a) 12 days   (b) 10days   (c) 14 days   (d) 8 days

3) A Process is to be controlled with standard values of mean=15 and standard deviation=3.5.The sample size is 9,the control limits for x-bar chart are
   a) 15±10.8   b) 15±3.5   c) 0.4±1 0.8   d) 0.4±3.6

4) If the primal problem gives an unbounded solution in LPP, the dual of the same will give
   (a) optimal solution   (b) unbounded solution
   (c) infeasible solution   (d) basic feasible solution

5) In transportation problems ,there are 4 supply centers and 5 demand centers the total quantity of supply available is greater than the total demand. The number of allocations without degeneracy, during an iteration is

   a) 6   b) 3   c) 9   d) 10

3

7) MECHANICAL SCIENCE
iii) INDUSTRIAL & PRODUCTION ENGINEERING
Syllabus & Model Question Paper

PART- B

INDUSTRIAL & PRODUCTION ENGINEERING

Metrology: Limits, Fits & tolerances. Gauges, Comparators, Surface Finish

Operations Research: LPP, Transportation, Assignment, Game Theory,

Quality Management: Statistical Process Control, Control charts, Inspection and Test, Sampling plans.

Work Study – Method Study, Work Measurement, Ergonomics.

CAD/CAM System – Hardware and Software, Modeling, Transformations, NC, CNC, Robot Configurations and Applications,

Metal Forming – Rolling, Forging, Extrusion, Sheet Metal Forming .

Engineering Economy, Depreciation, Cost Estimation.

Non Destructive Testing – Liquid Penetrant, Ultrasonic, Radiography, Magnetic Particle Inspection & Leak Test.

Welding Metallurgy & Heat Treatment.

Metal Cutting, Basic Theory – Tool Life, Tool Wear, Cutting Tools, Geometry & Materials.

PART – B
(INDUSTRIAL AND PRODUCTION ENGINEERING)
SECTION – I OF PART – B

Each question carries One Marks   **20 x 2 = 20 Marks**

1) Gauges are designed on the Principle of
    (a) GANTT   (b) TAYLOR
    (c) Gilbreth   (d) Maslows

2) Spherical co-ordinate is also known as
    (a) Polar co-ordinate   (b) Cylindrical
    (c) Joint arm   (d) Cartesian co-ordinate

3) Curved surface can be measured in a NC machine by
    (a) Point to point method   (b) Straight line
    (c) Contour method   (d) Bend axis method.

4) Following is not a metal forming process
        (a) Drawing   (b) Cupping
        (c) Milling   (d) None of the above

5) Following is a single point cutting tool
        (a) Grinding wheel   (b) Milling cutter
        (c) Lathe tool   (d) Hob.

SECTION – II OF PART - B
Each question carries two Marks   **10 x 2 = 20 Marks**

1) Surface roughness on a drawing is represented by
        (a) Circles   (b) Squares
        (c) Triangles   (d) Curves

2) Travel chart helps to decide
        (a) Production Schedule   (b) Material Handling
        (c) Inventory Control   (d) Cost of product

3) An machine is purchased for Rs.22, 000/- and has a life of 10 years. The salvage value is

   Rs.4, 000/-. Calculate the book value at the end of 8 years by
       straight line method.
        (a) Rs.7, 600/-   (b) Rs.8, 400/-
        (c) Rs.10, 000/-.   (d) Rs.9,200/-

4) Residual stresses in weld causes

        (a) Stress Concentration   (b) Distortion
        (c) Martensitic Structure   (d) None of above

5) Find the cutting speed for a job 20mm in diameter and rotating at 1000Rpm.
        (a) 62.8m/min   (b) 82m/min.
        (c) 31.4m/min   (d) None of above

7) MECHANICAL SCIENCE
iv) MANUFACTURING ENGINEERING
Syllabus & Model Question Paper
PART- B

OR – LPP, Transportation, Assignment Problems, Inventory Control, PERT - CPM

Theory Of Metal Cutting : Cutting Tools, Geometry , Materials, Measurement of Cutting Forces, Tool Wear and Life

Plasticity And Metal Forming : Yield Criteria, 2-D Plastic flow, Fundamentals of Metal Working , Drawing, Extrusion, Forging & Rolling.

Welding Technology: Introduction, Metal Joining Process, Welding Processes:- Pressure, gas and electric, Testing and Inspection.

Industrial Robotics: Robot components, Classification, Configuration, Direct and Inverse Kinematics, Robot Programming and Sensors.

Automation In Manufacturing: Automation: Definitions, reasons, high Volume Production Systems, Computerized Manufacturing Systems and Networks

CAD/ CAM

Product Cycle, Elements of CAD/CAM system – Hardware and Software, modeling, Transformations, NC, CNC machines.

Metrology And Measurements

Limits, Fits & tolerances, types of gauges, comparators, Surface finish equipments, pressure, flow and strain measurement

PART – B
(MANUFACTURING ENGINEERING)
SECTION – I OF PART –B
Each question carries One Marks   **20 x 1 = 20 Marks**

1) In an arc welding process, the voltage and current are 25 V and 300 A respectively. The arc heat transfer efficiency is 0.85 and welding speed is 8 mm/sec. The net heat input (in J/mm) is

      a) 64   b) 797   c) 1103   d) 79700

2) Which of the following arc welding processes does not use consumable electrodes?
      a) GMAW   b) GTAW
      c) Submerged Arc Welding   d) None of these

3) In a fillet welded joint, the weakest area of the weld is
      a) Toe   b) Root   c) Throat   d) Face

4) Four basic elements are required for an automated machine tool or production process. They are: input interface, memory, output interface, and

        a) Logic   b) NC tape programming.

        c) Software   d) Computer graphics work station

5) To obtain solution of material problem so that the cost of handling will be minimum is

        a) Simplex method   b) Queuing theory

        c) Transport method   d) Value engineering

SECTION – II OF PART – B

Each question carries two marks   **10 x 2 = 20 Marks**

1) During orthogonal cutting of mild steel with a 10° rake angle tool, the chip thickness ratio Was obtained as 0.4. The shear angle (in degrees) evaluated from this data is

    (a) 6.53   (b) 20.22   (c) 22.94   (d) 50.00

2) Forging of plain carbon steel is carried out at

    (a) 750^0C (b) 900^0C (c) 1100^0C (d) 1300^0C

3) Software package used for computer simulation is known as

        a) GPSS   (b) HTPM

        (c) CRAFT   (d) COMSAL

4) The Poisson's ratio of a martial which has Young's modulus of 120 GPa and shear modulus 50 GPa is'

    (a) 0.1   (b) 0.2   (c) 0.3   d) 0.4

5) 'What key hardware item ties a CAD/CAM system together?

        (a) Keyboard   (b) Graphics work station

        (c) Digitizer   (d) Plotter

7) MECHANICAL SCIENCE
v) MECHANICAL ENGINEERING
Syllabus & Model Question paper
PART-B

Heat Transfer: Modes of Heat transfer, one dimensional heat conduction. Fins Dimensionless parameters in convective heat transfer. Forced convection heat transfer over flat plates and through tubes. Free convection heat transfer over flat plates and cylinders, radiation, heat transfer, Heat exchangers, LMTD and NTU methods.

Industrial Management – Introduction, Management Function, Motivation and Behavior

Fluid Machines: Introduction, Principles of Hydraulic Machines, Impulse and Reaction Turbines, Steam Turbines.

Mechatronics: Introduction, Transducers, Mechatronic Elements, Pneumatic, Hydraulic, Electrical and Mechanical Actuation Systems, Signal Conditioning.

POM: Plant Layout , Plant Location, Forecasting, Scheduling , Inventory Control.

OR – LPP, Transportation, Assignment Problems, Inventory Control, PERT – CPM

CAD/ CAM:

Product Cycle, Elements of CAD/CAM system – Hardware and Software, modeling, Transformations, NC, CNC, Robots Configurations and Applications, Programming Language, Robotic Sensors.

Metrology and Measurements:

Limits, Fits & tolerances, types of gauges, comparators, Surface finish equipments, pressure, flow and strain measurement

MECHANICAL SCIENCES
(AUTO / IPE / IEM / MNF / ME)

PART – A

SECTION – I OF PART -A
(Common to AUTO / IPE / IEM / MNF / ME)

Each question carries One Marks   **30 x 1 = 30 Marks**

1) If 20 percent managers are technocrats the probability that a random committee of 5 managers
   Consists of exactly 2 technocrats is

a) 0.2048	b) 0.4000
c) 0.4096	d) 0.9421

2) In the Gauss elimination method for solving a system of linear algebraic equations triangularisation leads to
    a) Diagonal matrix   b) Lower triangular matrix
    c) Upper triangular matrix   d) Singular matrix

3) In a fibre reinforced composite
    a) Matrix is stronger than fibre
    b) Matrix is weaker than fibre
    c) Matrix and fibres are of equal strength
    d) None of the above

4) Which is the most effective alloying element is encreasing the hardness of steel for the same
    percentage of composition
    a) Mo   b) Ni   c) Cu   d) Cr

5) A fatigue fracture is characterized by
    a) Ductile fracture   b) Brittle Fracture
    c) Cup & cone formation   d) None of the above

PART – B
(MECHANICAL ENGINEERING)
SECTION – I OF PART – B
Each question carries One Marks   **20 x 1 = 20 Marks**

1) The highest value of thermal conductivity is expected for
    a) Solid ice   b) Melting ice
    c) Water   d) Boiling water
2) A public sector undertaking
    a) Is fully owned by private through shareholders
    b) Is jointly owned by private parties
    c) Is jointly owned by private parties and Government
    d) Is fully owned by Government

3) Which of the following is not part of signal conditioning system?
    a) Operational Amplifier   b) Filter
    c) Zener diode   d) Direction control vlue

4) By introducing a dummy activity in a network

    a) Logical sequence of activities is disturbed

b) Time is consumed additionally
c) Resources is allocated additionally
d) Unique numbering system for different activities is maintained

5) A robotic instrument is prevented from running into other objects by
          a) Sensory devices   b) Negative image
          c) Bubble memory   d) Pixel

(MECHANICAL ENGINEERING)
SECTION – II OF PART – B

Each question carries two marks   **10 x 2 = 20 Marks**

1) Helium is flowing in a pipe line at a velocity of 350 m/s and pressure and temperature of 100 kPa and 25°C. The stagnation temperature is
    a) 298.8 k   b) b) 305.5 k   c) 358.95 k   d) 368.8 k

2) Two parallel opposed, infinite black planes are maintained at 300°C and 400°C respectively. If the temperature difference is doubled by increasing the temperature from 400°C to 500°C, the heat exchange rate will increase by a factor of about
    a) 2.5   b) 4.5   c) 5.5   d) 6.25

3) When the temperature of a solid surface changes from 227°C to 1227°C, its total emissive power changes from E_1 to E_2. The ratio (E_2/E_1) will be

    a) 3   b) 6   c) 9   d) 81

4) In a forecasting model, at the end of period 13, the forecasted value for period 14 is 75. Actual value in the period 14 to 16 are constant at 100. If the assumed simple exponential smoothing parameter is 0.5, then the MSE at the end of period 16 is

    a) 820.31   b) 273.44   c) 43.75   d) 14.58

5) At a production machine, parts arrive according to a Poisson process at the rate of 0.35 parts per minute. Processing time for parts have exponential distribution with mean of 2 minutes. What is the probability that a random part arrival finds that there are already 8 parts in the system (in machine + in queue)?

    a) 0.0247   b) 0.0576   c) 0.0173   d) 0.082