Total No. of Questions: Total No. of Pages:

Roll No. _____

B.Tech. V-Sem. (Main/Back) Exam 2025
Automobile Engg.
5AE3-01Mechatronic Systems
5E1718
AE,ME

Time: 3 Hours   Maximum Marks: 70

Attempt all ten questions from Part A, five questions out of seven questions from Part B and three questions out of five questions from Part C.
   Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be
    assumed and stated clearly. Units of quantities used/ calculated must be stated clearly.
    Use of following supporting material is permitted during examination. (Mentioned in form
No.205)
   1_____   2. _____

Part A (Answer should be given up to 25 words only)
All questions are compulsory

Q. 1 List any five types sensors with example.
Q.2 Give the name of four actuators.
Q.3 Why brushes are not used in BLDC?
Q.4 What do you mean by parking system.
Q.5 Define Kirchhoff's law.
Q.6 Give four differences between microprocessor & microcontroller.
Q.7How do mechatronics system contribute to automation in manufacturing.
Q.8What are the different types of system modeling.
Q.9 List five advantages of pneumaticsystem over hydraulic system.
Q.10 What is the use of PLC in mechatronics.   10 x 2 = 20

Part B(Analytical/Problem solving questions)
Attempt any Five questions

Q.1What is actuator, explain it with applications.
Q.2 With help of suitable example explain the working & construction of BJT.
Q.3 A motor has a torque constant of 100Nm A & voltage constant of 12V per kilo
revolution/mm. The armature resistance is 2Ω. If 24Vvoltage is applied to the terminal, what
would be,
A) The torque at rotor
B) Torque at 100rpm Plot the result as a speed versus torque graph.
Q.4. Name & explain two examples of sequential control system.
Q.5 Explain application on real time industrial automation system using PLC.
Q.6 Why there is need of modeling.
Q.7 Define data acquisition system in mechatronics.   5x 4 = 20

Part C(Descriptive/Analytical/Problem Solving/Design question)
Attempt any three questions

Q. 1Write the case study with proper example of car engine management system.

Q.2 Discuss the fault analysis in mechatronics system.

Q.3 With the suitable example explain the automatic parking system.

Q.4Write short note on

A) BLDC   B) Signal condition   C) PID controller

Q.5 What are the operations used in control system. Also explain the control system for mechatronic applications.   **3 x 10= 30**

5E1719

5E1719

B.Tech. V - Sem. (Main & Back) Examination, November/December-2025
Automobile Engg.
5AE4-02 Heat Transfer
AE, ME

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

*Attempt **all Ten** questions from **Part A**, **five** questions out of **Seven** questions from **Part B** and **Three** questions out of **Five** questions from **Part C**.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

ALL questions are Compulsory.   (10×2=20)

1. State Fourier's law of heat conduction .

2. Define thermal conductivity.

3. What do you understand by critical radius of insulation?

4. Define fin effectiveness.

5. Define the Biot number and its physical significance.

6. Define the hydrodynamic boundary layer and thermal boundary layer over a flat plate.

7. Define the Grashof number and explain its significance in natural convection.

8. Differentiate between nucleate boiling and film boiling

9. What is NTU in heat exchangers?

10. State Kirchhoff 's law of radiation.

PART - B

(Analytical/Problem Solving Questions)

Attempt any FIVE questions.   (5×4=20)

1. A cylindrical rod , length 0.5 m and cross-sectional area 2×10^{-4} m², is made of a material with thermal conductivity k = 15 W/m.K. Its ends are maintained at 100°C and 25°C. Calculate the rate of heat conduction through the rod.

2. Explain how to determine the critical thickness of cylindrical insulation for minimal heat loss.

3. Derive the expression for fin efficiency for an insulated tip fin of rectangular profile

4. In a parallel - flow heat exchanger, hot fluid enters at 120°C and leaves at 80°C. Cold fluid enters at 30°C and leaves at 60°C. Determine the LMTD.

5. Explain the various regimes of pool boiling and sketch the typical boiling curve.

6. Differentiate between black body and grey body. Also define emissivity.

7. Explain Planck's law and wien's displacement laws along with their mathematical expressions?

PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any THREE questions.   (3×10=30)

1. Derive the general three-dimensional steady state heat conduction equation with heat generation in cartesian coordinates.

2. A rectangular fin of length 5 cm and cross-section 5 mm × 5 mm is attached to a wall maintained at 150°C. Ambient air is at 25° C and h = 40 W/m². K.k=200 W/m.K. Calculate heat transfer and fin efficiency assuming the fin tip is insulated.

3. Explain the difference between natural and forced convection. Derive the expression for the local and average convective heat transfer coefficient over a flat plate using boundary layer theory .

4. Hot oil flows at 2 kg/s (c_p = 2.5 kJ/kg.K) and is cooled from 180°C to 130° C in a counter-flow heat exchanger. Water enters at 20°C at 1.5kg/s (C_p=4.18 kJ/kg.K). Calculate the rate of heat transfer, outlet temperature of water, and effectiveness using the NTU method.

5. Explain the concept of view factor (shape factor) and its governing rules. Derive and illustrate the reciprocity and summation rules with examples.

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5E1720

5E1720

B.Tech. V- Sem. (Main & Back) Examination, November/December -2025
Automobile Engineering
5AE4-03 Manufacturing Technology
AE, ME

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

Attempt **all Ten** questions from **Part A**, **five** questions out of **Seven** questions from **Part B** and **Three** questions out of **Five** questions from **Part C**.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.   (10×2=20)

1.   Define orthogonal and oblique cutting.

2.   Define rake angle and clearance angle.

3.   Define Machinability index.

4.   State and explain Taylor's tool life equation.

5.   Define the gear hobbing.

6.   Write the formula for machining time in Shaper.

7.   Define honing and lapping.

8.   Name two natural and two synthetic abrasives?

9.   Define high velocity forming.

10. Define magnetic pulse forming.

PART - B

(Analytical/Problem Solving questions)

Attempt any Five questions.   (5×4=20)

1. Differentiate between traditional and non-traditional machining processes.

2. Explain different types of chips produced in metal cutting with sketches.

3. Classify cutting fluids and discuss their desirable properties.

4. Explain the mechanism of crater wear and flank wear in cutting tools.

5. Describe the procedure of gear cutting on a milling machine using indexing head.

6. Describe the process of superfinishing. Compare it with conventional grinding.

7. Explain the principle and working of hydraulic forming with a neat sketch.

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions.   (3×10=30)

1. Discuss the geometry of a single-point cutting tool with neat sketch and explain function/importance of each element and angle. Explain ASA and ORS tool nomenclature systems.

2. Write a note on :

    a)   Effect of cutting variables on tool life

    b)   Use of cutting fluids in improving tool life and surface finish.

3. A cylindrical mild steel shaft of 500 mm length and initial diameter of 80 mm is to be turned down to 60 mm diameter using a single-point cutting tool on a lathe in 4 equal passes. The cutting parameters are:

    Cutting speed (V) = 50 m/min

    Feed(f) = 0.3 mm/rev

    Tool approach and retraction = 5 mm each

    Return time per pass = 6 seconds

    Setup time = 2 minutes

    Calculate the total machining time required to complete the job.

4. Explain the grinding process and classify the different types of grinding methods.

5. Explain Explosive Forming and Electro-Hydraulic Forming with neat sketches.

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5E1720   (2)

5E1721

5E1721

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Automobile Engineering
5AE4-04 Design of Machine Elements - I
AE, ME

Time : 3 Hours   Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.   (10×2=20)

1.   Briefly explain the principle of design for assembly.

2.   Explain the endurance strength of material.

3.   List the causes of stress concentration in a component.

4.   State the scope of the course, design of machine elements.

5.   What is the critical speed of shaft?

6.   What is meant by bolts of uniform strength?

7.   What do you mean by factor of safety?

8.   Write the expression of stresses induced in 'Kennedy key'.

9.   Write the objective of course "Design of Machine Elements".

10. Write the advantages of cast iron as an engineering material.

PART - B
(Analytical / Problem Solving Questions)
Attempt any Five questions. (5×4=20)

1. How is a cotter joint made? Discuss the applications of a cotter joint.
2. A solid shaft is transmitting 1 MW at 260 rpm. Determine the diameter of the shaft if the maximum torque transmitted exceeds the mean torque by 20%. Take the maximum allowable shear stress as 70 MPa.
3. What is self-locking of the power screw? What is the condition for self-locking?
4. What is stress concentration? How is it mitigated?
5. A rigid coupling is used to transmit 20 kW power at 710 r.p.m. There are four bolts, and the pitch circle diameter of the bolts is 120 mm. The bolts are made of steel 45C8 ($Syt = 380$ N/mm^2) and the factor of safety is 3. Determine the diameter of the bolts.
6. What are the preferred numbers? Discuss its uses.
7. Design a crane hook with the useful load lifting capacity of the crane as 50 kN. The weight of the hook with grabbing tongs is 10 kN.

PART - C
(Descriptive / Analytical / Problem Solving / Design Questions)
Attempt any Three questions. (3×10=30)

1. Write a short note on:
   a) Ergonomics
   b) Allowable stress
   c) Stiffness of spring
   d) Beam column.
2. Design a gib and cotter joint to resist safely a tensile load of 40 kN. The material of the gib, cotter and rods is same for which the allowable safe stresses are:

   $\sigma c = 60$ N/mm^2

   $\sigma t = 25$ N/mm^2

   $\sigma s = 20$ N/mm^2
3. Design a crank hook with the useful load lifting capacity of the crane as 50 kN. The weight of the hook with grabbing tongs is 10 kN.
4. a) Write a note on 'Design for Assembly'. (4)
   b) Manufacturing consideration is an important material selection criterion. Explain. (3)
   c) The surface roughness is limited by the manufacturing method used. Explain. (3)
5. Two shafts 100 mm diameter are to be connected by means of two cast iron couplings. The allowable shearing stress of the bolt material is 45 N/mm^2. While that of the shaft material is 55 N/mm^2. Find the size of the bolts to be used. Check the flange for the induced crushing stress. Is it safe for stress?

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5E1722

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Automobilie Engineering
5AE4-05 Principles of Management
AE, ME

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. (10×2=20)

1. Define Management.

2. What do you mean by 'Unity of Command'?

3. Define Leadership.

4. Write the difference between 'risk' and 'uncertainity' in decision making.

5. Mention any four characteristics of an Organisation.

6. What are the various sources of external recruitment?

7. What are Maslow's Hierarchy of Needs?

8. Define grapevine communication.

9. Define Productivity.

10. What are the qualities of a Leader?

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. (5×4=20)

1. Explain the functions and roles of Management.

2. Explain the various Environmental Factors affecting Management.

3. Explain in detail the different levels of Management and Skills needed for them.

4. Explain various Matrix Structure of any Organisation.

5. Explain in detail about Industry 4.0. Also state how it helps to Manage Business under different domains.

6. "A good leader is not necessarily good Manager". Discuss this statement and compare leadership with Management.

7. Describe the contribution of any two management thinkers.

   a) Ratan Tata

   b) Steve Jobs

   c) Bill Gates

   d) Narayan Murthy

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. (3×10=30)

1. Define Organisation Structure Matrix and describe its effect with respect to any two companies.

2. What is Leadership? How a leader will lead the Organisation? Justify with suitable example of profile of any two leaders.

3. Describe the contributions of Kautilya and C.K.Prahalad.

4. Classify various motivational theories and explain the Maslow's Hierarchy of needs with diagram.

5. Prepare the leadership profile of any three business leaders and their qualities.

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5E1724

5E1724

B.Tech. V-Sem. (Main&Back) Examination, November/December - 2025
Automobile Engineering
5AE5-12 Automobile Engineering (Elective-I)
AE, ME

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Three questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory. (10×2=20)

1. Write any three scopes and three objectives of automobile engineering.
2. List any four types of chassis frames used in automobiles.
3. What is the function of a fluid coupling in automotive systems?
4. Differentiate between mechanical and hydraulic brakes.
5. Name the components of a synchromesh gearbox.
6. What is the purpose of a differential in automobile drive systems?
7. State any four causes of tyre wear in vehicles.
8. Define understeer and oversteer in steering systems.
9. What are the main components of an automotive battery charging system?
10. List various safety devices used in modern automobiles.

PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions. (5×4=20)

1. Explain the constructional features and working principle of a single plate clutch with a suitable diagram.

2. Compare sliding mesh and constant mesh gear boxes with their advantages and disadvantages.

3. Describe the construction and working of Hotchkiss drive system with a suitable diagram.

4. Explain the effect of camber, caster and king pin inclination on vehicle steering geometry with a suitable diagram.

5. Explain the working principle of the independent suspension system and its benefits.

6. Describe the construction and working of a magneto ignition system.

7. Discuss the components and working of an automotive air conditioning system with a suitable diagram.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Three questions. (3×10=30)

1. a) Explain the construction, working and application of multi-plate clutch system. (5)

   b) Compare electromagnetic and vacuum clutches with their merits and demerits. (5)

2. a) Describe the construction and working of epicyclic gear boxes with a neat sketch. (5)

   b) Explain the principle and advantages of automatic transmission system in modern vehicles. (5)

3. a) Explain the construction and working principle of hydraulic brake systems with line diagram. (5)

   b) Discuss the brake shoe material and their selection criteria for different vehicle applications. (5)

4. a) Explain the construction and working of power steering systems. (5)

   b) Describe the steering geometry parameters and their effects on vehicle handling and stability. (5)

5. a) Describe the construction, working and testing procedures of automotive batteries. (5)

   b) Explain the construction of alternator, its regulation and rectification process in charging systems. (5)

5E1321

B.Tech. V-Sem. (ReBack) Examination, November/December - 2025
ESC Automobile Engg.
5AE3-01 Mechatronic Systems
AE,ME

Time : 2 Hours

Maximum Marks : 80
Min. Passing Marks : 28

Instructions to Candidates:

Attempt all Five questions from Part A, Four questions out of six questions from Part B and Two questions out of three questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A
(Answer should be given up to 25 words only)

All questions are Compulsory. (5×2=10)

1. Define the term Mechatronics.

2. Briefly explain the difference between Verification and Validation in the context of Systems Engineering.

3. Enlist and briefly describe the two most important static characteristics of a sensor.

4. What is a Microcontroller?

5. Explain the primary function of a Timer and a Counter instruction in Programmable Logic controller (PLC) programming.

PART - B
(Analytical / Problem Solving Questions)

Attempt any Four questions. (4×10=40)

1. Draw a neat Block Diagram of a Mechatronic System. Explain the function of each major functional element in the diagram.

2. State and explain Kirchhoff's Current Law (KCL) and Kirchhoff's Voltage Law (KVL) with reference to electrical circuits.

3. Write short note on any two
   a) Hydraulic and Pneumatic actuators
   b) Sensors
   c) Micro and Nano sensors

4. Explain the concept of system stability in dynamic systems.

5. Classify electrical Actuators and explain the working principle of a stepper Motor.

6. Draw and explain the basic Architecture of a progammable logic controller (PLC), detailing the role of the CPU, I/O modules, and Memory.

PART - C
(Descriptive / Analytical / Problem Solving / Design Questions)
Attempt any Two questions. (2×15=30)

1. Write short notes on any Two
   a) PID controllers
   b) Mechanical systems
   c) Thermal systems
   d) Servo motor, BLDC motor

2. Describe the working principle of an Inductive Proximity Sensor and an RTD (Resistance Temperature Detector). Discuss the five most important selection criteria that an engineer must consider when choosing a sensor for a specific application.

3. Consider the Car Engine Management System (CEMS) as a Mechatronic Case Study. Explain how the CEMS controls the air-fuel mixture and ignition timing.

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5E1322

5E1322

B.Tech. V-Sem. (Mercy Back) Examination, November/December - 2025

Automobile Engg.

5AE4-02 Heat Transfer

AE, ME

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks:42

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A

(Answer should be given up to 25 words only)

All questions are Compulsory.   (10×2=20)

1. Define Fourier's law of heat conduction.

2. Discuss Newton's law of cooling.

3. How heat conduction through composite walls takes place; What is the critical thickness of insulation?

4. Where the Heisler chart is used?

5. What is a Grashoff number?

6. A long pipe of 0.6 m outside diameter is buried in earth with axis at a depth of 1.8m. The surface temperature of pipe and earth are 95°C and 25°C respectively. Calculate the heat loss from the pipe per unit length. The conductivity of earth is 0.51W/mk.

7. The temperature at the inner and outer surfaces of a boiler wall made of 20mm thick steel and covered with an insulating material of 5mm thickness are 300°C and 50°C respectively. If the thermal conductivities of steel and insulating material are 58W/m°C and 0.116W/m°C respectively, determine the rate of flow through the boiler wall.

8. What is the arithmetic and logarithmic mean temperature differences?

9. How fouling factor is used in heat transfer?

10. What is the Krichoff's law?

PART - B
(Analytical / Problem Solving Questions)
Attempt any Five questions. $(5 \times 8 = 40)$

1. What is the effect of temperature on thermal conductivity of solids, liquids and gases?
2. Derive the equation of one dimensional heat conduction with and without heat generation.
3. Discuss the equation of fin, fin efficiency and effectiveness.
4. What is the hydrodynamic and thermal boundary layers? What is the laminar boundary layer equations?
5. A spherical container of negligible thickness holding a hot fluid at 140°C and having an outer diameter of 0.4 m is insulated with three layers of each 50 mm thick insulation of $K_1 = 0.02$; $K_2 = 0.06$ and $K_3 = 0.16$ W/mK. (Starting from inside). The outside surface temperature is 30°C. Determine i) the heat loss, and ii) Interface temperatures of insulating layers.
6. Discuss the heat transfer coefficient for parallel, counter and cross flow type heat exchanger.
7. Elaborate in detail, Plank distribution law and Lambert's law.

PART - C
(Descriptive / Analytical / Problem Solving / Design Questions)
Attempt any Four questions. $(4 \times 15 = 60)$

1. Derive the general 3-Dimensional conduction equation in Cartesian, cylindrical and spherical coordinates.
2. Obtain the empirical relations for flow over a flat plate and flow through pipes.
3. Discuss in detail, i) different regimes of boiling heat transfer?
   ii) correlations for saturated liquid vaporization, iii) condensation of flat plates, iv) drop wise condensation.
4. A parallel flow heat exchanger is used to cool 4.2 kg/min of hot liquid of specific heat 3.5 kj/kg K at 13°C. A cooling water of specific heat 4.18 Kj/kg K is used for cooling purpose of a temperature of 15°C. The mass flow rate of cooling water is 17 kg/min. Calculate the following.
   1. Outlet temperature of liquid
   2. Outlet temperature of water
   3. Effectiveness of heat exchanger Take overall heat transfer co-efficient is 1100 W/m² K. Heat exchanger area is 0.30m².
5. How the heat exchange takes place between two black and two gray bodies?

5E1325

5E1325

B.Tech. V-Sem. (Re Back) Examination, December - 2025
PCC/PEC Automobile Engg.
5AE4-05 Principles of Management
AE,ME

Time : 2 Hours

Maximum Marks : 80
Min. Passing Marks : 28

Instructions to Candidates:

Attempt all Five questions from Part A, Four questions out of Six questions from Part B and Two questions out of Three questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART - A
(Answer should be given up to 25 words only)

All questions are Compulsory.   (5×2=10)

1. What is KRA?

2. What are the needs mentioned in Maslow's theory?

3. What do you mean by "unity of command"?

4. What are the various skills required of a manager?

5. Mention any four characteristics of an organization.

PART - B
(Analytical / Problem Solving Questions)

Attempt any Four questions.   (4×10=40)

1. Write Fayol's fourteen principles of management.

2. Distinguish between "risk" and "uncertainty" in decision making.

3. What is meant by "Delegation of Authority"?

4. State the important factors in determining an effective span of management.

5. What are the various approaches to (theories of) leadership?

6. What are the differences between administration and management.

PART - C

(Descriptive / Analytical / Problem Solving / Design Question)

Attempt any Two questions. (2×15=30)

1. What is recruitment? What are the various sources of external recruitment?

2. What is Performance Appraisal? Discuss various methods of performance appraisal with their merits and demerits.

3. What is Communication? Discuss various types of communication and major barriers to communication.

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Roll No. _____ [Total No. of Pages : 3

5E1324

5E1324

B.Tech. V-Sem. (Re Back) Examination, November/December - 2025
Automobile Engg.
5AE4-04 Design of Machine Elements-I
AE,ME

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks:42

Instructions to Candidates:

Attempt all Ten questions from Part A, Five questions out of seven questions from Part B and Four questions out of five questions from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.

Use of following supporting material is permitted during examination.

(Mentioned in form No. 205).

PART-A

(Answer should be given up to 25 words only)

All questions are Compulsory. (10×2=20)

1. Write the course objectives of the course "Design of machine Elements I".

2. Write any four mechanical properties of steel.

3. What is the importance of tolerance?

4. Define stiffness.

5. Write the causes of stress concentration.

6. Define fatigue.

7. Write the difference between bearing stress and crushing stress.

8. Define beam.

9. Comment on "self locking screw"

10. Write any three types of keys.

## PART - B

(Analytical / Problem Solving Questions)

Attempt any Five questions.   (5×8=40)

1. Discuss about limits.

2. Write the design procedure of screw jack.

3. Discuss on bolt of uniform strength.

4. Discuss on manufacturing considerations in design in detail with diagram.

5. Write the design procedure of a lever. You may select any kind of lever.

6. A steel plate is subjected to a force of 5 kN and fixed to a channel by means of three identical bolts as shown in figure. The bolts are made of steel having yield tensile strength is 400 N/mm². Design the size of bolts. The linear dimensions are in mm.
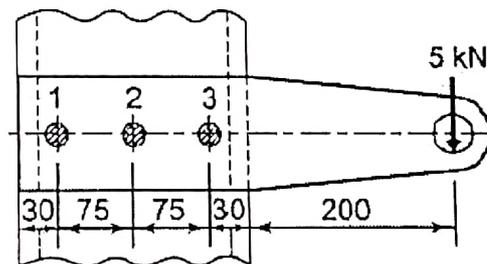
7. A cantilever beam of length L is subjected to a point load acting at the free end. The cross section of the beam is rectangular (b x h). Take modulus of elasticity is E. Discuss about the critical stresses.

PART - C

(Descriptive / Analytical / Problem Solving / Design Questions)

Attempt any Four questions.   (4×15=60)

1. Design a cotter joint connect two rods of equal diameter. The axial load acting on each rod is 40 kN. Select suitable material.

2. A propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft having inside diameter of 0.6 times of outside diameter. It is made of plain carbon steel and the permissible shear strength is 90 N/mm². Calculate the inside and outside diameters of the shaft.

3. A shaft 40 mm diameter is transmitting 35 kW power at 300 rpm by means of square key of 10 × 10 mm cross section. The key is made of steel ($S_{yt}=S_{yc}=380$ MPa and factor of safety is 3. Determine the required length of the key if the shaft is 20% overload.

4. Write the design procedure of muff coupling.

5. Discuss on design of C Clamp.

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