

Hall Ticket Number :									
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R-20

Code: 20A36AT

III B.Tech. II Semester Regular Examinations June 2023

Automobile Engineering
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two marks**.
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

- | | | |
|---|----|----|
| 1. Answer all the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) What is a Horn? | 1 | 1 |
| b) Explain the use of Clutch. | 2 | 1 |
| c) What are the uses of steering system? | 3 | 1 |
| d) Write a brief note on anti-theft system | 4 | 1 |
| e) List the advantages of hybrid vehicles. | 5 | 1 |

PART-B

Answer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|---|----|---|---|
| 2. a) Compare the features and functionalities of 2-stroke and 4-stroke IC engines. | 6M | 1 | 4 |
| b) Write short notes on Bendix drive and the solenoid switch. | 6M | 1 | 2 |

OR

- | | | | |
|--|----|---|---|
| 3. a) List the objectives of supercharging? | 6M | 1 | 2 |
| b) Explain with a neat sketch the working principle of turbo charging of a single cylinder engine. | 6M | 1 | 3 |

UNIT-II

- | | | | |
|--|-----|---|---|
| 4. Draw and explain with a simple sketch, working of a constant mesh gear box. | 12M | 2 | 4 |
|--|-----|---|---|

OR

- | | | | |
|--|-----|---|---|
| 5. Explain in detail with neat sketches about Hotchkiss drive and torque tube drive. | 12M | 2 | 3 |
|--|-----|---|---|

UNIT-III

- | | | | |
|---------------------------------|-----|---|---|
| 6. Discuss the following terms | | | |
| a) Pneumatic Braking system and | | | |
| b) Vacuum braking system | 12M | 3 | 3 |

OR

7. a) Discuss a steering linkage for a vehicle with independent suspension. 6M 3 3
- b) Explain the terms:
 (i) Camber (ii) Toe-in (iii) King Pin inclination. 6M 3 3

UNIT-IV

8. Explain the working of seat belt system and Antilock braking system (ABS) 12M 4 3

OR

9. How air bag restraint works in automobile and Explain the working of anti-theft system of an automobile. 12M 4 2

UNIT-V

10. a) List and compare the Advantages and disadvantages of EV compared to ICE vehicles. 6M 5 2
- b) Write short notes on the history of Hybrid and Electrical Vehicles. 6M 5 2

OR

11. Sketch the layout of electrical vehicle and elaborate the importance of each component in detail. 12M 5 5

***** End *****

Hall Ticket Number :

R-20

Code: 20A36DT

III B.Tech. II Semester Regular Examinations June 2023

Automation & Robotics

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. In Part-A, each question carries **Two marks**.3. Answer **ALL** the questions in **Part-A** and **Part-B****PART-A**

(Compulsory question)

1. Answer **all** the following short answer questions (5 X 2 = 10M)
- | | | |
|--|-----|----|
| | CO | BL |
| a) What is the need for automation? | CO1 | L1 |
| b) Write down the benefits of flexible manual assembly line? | CO2 | L1 |
| c) State the law of robot? | CO3 | L1 |
| d) What is the application of trajectory planning? | CO4 | L3 |
| e) Differentiate the hydraulic and pneumatic actuator? | CO5 | L2 |

PART-BAnswer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

2. Describe the elements of automated system with suitable sketch? 12M CO1 L2

OR

3. Sketch and explain the automated flow line with buffer storage? 12M CO1 L1

UNIT-II

4. Solve the problem by using Rank position weight method. Consider the following assembly network relation shown in table. The number of shifts per day is one and the number of working hours is 8. The company aims to produce 40 units of the product per shift. To compute the balancing efficiency of the line.

Operation number	Immediate preceding tasks	Duration (Min)
1.	--	8
2.	1	3
3.	1	2
4.	1	4
5.	3,4	7
6.	2,7	4
7.	2,4,5	5
8.	4	6
9.	6,8	8

12M CO2 L5

OR

5. Explain the procedure associated with line balancing using Largest candidate rule? 12M CO2 L1

UNIT-III

6. Discuss the degrees of freedom in Robots and what is significance of the same? 12M CO3 L2

OR

7. Classify the different types of grippers and explain any one of the same with neat sketch? 12M CO3 L4

UNIT-IV

8. Discuss the D-H rotation with suitable sketch? 12M CO4 L2

OR

9. Describe the concept of trajectory planning and explain skew motion and straight line motion? 12M CO4 L2

UNIT-V

10. Discuss the function of the following
(i) Resolver (ii) Encodes (iii) Potentiometer 12M CO5 L2

OR

11. Explain the applications of robot 12M CO5 L3

*** End ***

Hall Ticket Number :									
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R-20

Code: 20A363T

III B.Tech. II Semester Regular Examinations June 2023

CAD/CAM

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two marks**.
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

- | | | | |
|---|-----------------|-----|-----|
| 1. Answer all the following short answer questions | (5 X 2 = 10M) | CO | BL |
| a) What do you understand by the CPU? | | CO1 | BL1 |
| b) Write the parametric form of plane surface? | | CO2 | BL2 |
| c) State the meaning of M and G functions? | | CO3 | BL2 |
| d) Quote the difference between FMS and FMC. | | CO4 | BL2 |
| e) What is CAQC? | | CO5 | BL2 |

PART-B

Answer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|--|----|-----|-----|
| 2. a) Discuss about different display devices | 6M | CO1 | BL2 |
| b) What is the most commonly used graphic terminal? Explain its working. | 6M | CO1 | BL2 |

OR

- | | | | |
|---|----|-----|-----|
| 3. a) Compare the traditional and CAD/CAM of product cycle. | 6M | CO1 | BL2 |
| b) Identify the applications of computer in design? | 6M | CO1 | BL2 |

UNIT-II

- | | | | |
|---|----|-----|-----|
| 4. a) Describe the various surface entities that are needed to construct a surface model. | 6M | CO2 | BL3 |
| b) Summarize the importance of surface modeling in computer aided graphics and design. | 6M | CO2 | BL3 |

OR

- | | | | |
|---|----|-----|-----|
| 5. a) What is solid modeling? Compare Bezier representation with CSG representation scheme. | 6M | CO2 | BL3 |
| b) Paraphrase the parametric equation of a composite surface. | 6M | CO2 | BL3 |

UNIT-III

- | | | | |
|---|----|-----|-----|
| 6. a) How NC machines are are classified? Explain them with neat sketches. | 6M | CO3 | BL2 |
| b) With neat sketches, write down the neat procedure for manual part programming. | 6M | CO3 | BL2 |

OR

- | | | | |
|---|----|-----|-----|
| 7. a) Interpret linear and circular interpolations in CNC systems. | 6M | CO3 | BL2 |
| b) Discuss the basic feedback control systems used in CNC machines. | 6M | CO3 | BL3 |

UNIT-IV

- | | | | |
|---|----|-----|-----|
| 8. a) Write the advantages and disadvantages of OPITZ code system. | 6M | CO4 | BL2 |
| b) What is a production Flow Analysis? Discuss various steps involved in PFA. | 6M | CO4 | BL3 |

OR

- | | | | |
|--|-----|-----|-----|
| 9. Analyze the following types of layouts in the design of FMS.
a) Circular layer b) Linear layers c) Loop layers d) Free layout. | 12M | CO4 | BL3 |
|--|-----|-----|-----|

UNIT-V

- | | | | |
|---|----|-----|-----|
| 10. a) Describe about different noncontact optical inspection methods. | 6M | CO5 | BL2 |
| b) Illustrate in detail the scanning laser system used in computer aided quality control. | 6M | CO5 | BL2 |

OR

- | | | | |
|--|-----|-----|-----|
| 11. Show the application and advantages of integration of CAQC with CAD/CAM systems. | 12M | CO5 | BL2 |
|--|-----|-----|-----|

*** End ***

Hall Ticket Number :

R-20-SS

Code: 20A353T

III B.Tech. II Semester Regular Examinations June 2023

Design of Machine Elements - II

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. In Part-A, each question carries **Two marks**.3. Answer **ALL** the questions in **Part-A** and **Part-B****PART-A****(Compulsory question)**1. Answer **all** the following short answer questions (5 X 2 = 10M)

- | | | |
|---|-----|----|
| | CO | BL |
| a) What are the commonly used materials for flat belts? | CO1 | L2 |
| b) What are the commonly used materials for sliding contact bearings? | CO2 | L2 |
| c) Define static load carrying capacity of ball bearing. | CO3 | L1 |
| d) How the number of teeth affect the design of gear? | CO4 | L2 |
| e) What is the function of crank in I.C Engine? | CO5 | L2 |

PART-BAnswer **five** questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|--|-----|-----|----|
| 2. a) V-Belt drive consists of three V- belts in parallel on grooved pulleys of the same size. The angle of the groove is 30° and the coefficient friction is 0.12. The cross sectional area of each belt is 800 mm ² and the permissible safe stress in the belt material is 3MPa. Calculate the power that can be transmitted between two pulleys 400 mm in diameter rotating at 960 rpm. | 10M | CO1 | L4 |
| b) How V-belt is specified? | 2M | CO1 | L2 |

OR

- | | | | |
|--|-----|-----|----|
| 3. a) What is the function of a spring? | 2M | CO1 | L2 |
| b) A spring loaded safety valve for a boiler is required to blow-off at a pressure of 1.5 N/mm ² , the diameter of the valve is 60 mm. Design a suitable compression spring for the safety valve, assuming spring index to be 6 and 25 mm initial compression. The maximum lift of the valve is 15 mm, the shear stress in the spring material is to be limited to 450 MPa. Take G= 0.84x10 ⁵ MPa. | 10M | CO1 | L4 |

UNIT-II

- | | | | |
|--|-----|-----|----|
| 4. a) Write down McKee's equation for coefficient of friction/ | 2M | CO2 | L2 |
| b) Design a journal bearing for a centrifugal pump to the following specifications.
Diameter of Journal: 75 mm, Speed of journal : 1140 rpm.
Load on each journal : 11500 N. | 10M | CO2 | L6 |

OR

- | | | | |
|---|-----|-----|----|
| 5. a) What are the commonly used bearing materials? | 2M | CO2 | L2 |
| b) A 75 mm journal bearing 100 mm long is subjected to 2.5 kN at 600 rpm. If the room temperature is at 24°C, what viscosity of oil should be used to limit the bearing temperature at 55°C? Take d/c=1000. | 10M | CO2 | L6 |

UNIT-III

6. a) Define static load carrying capacity of a rolling contact bearing. 2M CO3 L2
 b) Select a single row deep groove ball bearing for a radial load of 4000N and an axial load of 5000N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load 10M CO3 L6

OR

7. a) A ball bearing is operating on a work cycle consists of three parts.
 i) A radial load of 3000N at 1440 rpm for $\frac{1}{4}$ cycle
 ii) A radial load of 5000N at 720 rpm for $\frac{1}{2}$ cycle
 iii) A radial load of 2500N at 1440 rpm for the remaining cycle.
 The expected life of the bearing is 10,000 hrs. Calculate the dynamic load carrying capacity of the bearing. 10M CO3 L6
 b) Define dynamic load carrying capacity of rolling contact bearing. 2M CO3

UNIT-IV

8. a) Why dedendum value is more than the addendum value? 2M CO4 L2
 b) Design a spur gear pair to transmit a 1.5 kW at 1440 rpm from an electric motor to an air-compressor running at 720 rpm. Take the working life as 10,000 hrs. 10M CO4 L6

OR

9. a) State the applications of gear drives. 2M CO4 L1
 b) A pair of helical gears with 23° helix angle is to transmit 2.5 kW at 1000 rpm of the pinion. The velocity ratio is 4:1. The pinion is to be forged steel and the driven gear is to be cast steel. The gears are made of 20° full depth involute form and the pinion is to have 24 teeth. Design gear drive. 10M CO4 L6

UNIT-V

10. a) What are the commonly used piston materials? 2M CO5 L2
 b) Design a cast iron piston for a single acting four stroke diesel engine for the following data:
 Cylinder bore: 100 mm, stroke length: 120 mm, Max. Gas pressure : 6MPa, BMEP : 0.7MPa, Fuel consumption : 0.24 kg/kW/hr. Distance of the bearing from the center of the crank pin is 350mm, Design stress for crankshaft and crank pin = 35 N/mm^2 , Design tensile stress for crankshaft and key: 65 N/mm^2 . 10M CO5 L6

OR

11. a) What are the manufacturing methods for the crank shaft? 2M CO5 L2
 b) Design an overhang crank shaft for a steam engine to the following specifications. Diameter of the piston: 400 mm, stroke of the piston: 600 mm, Max. steam pressure : 10 N/mm^2 , the speed of the engine: 100 rpm, 10M CO5 L6

*** End ***

Hall Ticket Number :

R-20

Code: 20A361T

III B.Tech. II Semester Regular Examinations June 2023

Heat Transfer

(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)2. In Part-A, each question carries **Two marks**.3. Answer **ALL** the questions in **Part-A** and **Part-B****PART-A**

(Compulsory question)

- | | | |
|--|----|----|
| 1. Answer all the following short answer questions (5 X 2 = 10M) | CO | BL |
| a) Write the basic assumptions made in writing Fourier's law of heat conduction. | 1 | 1 |
| b) What is critical radius of insulation? | 2 | 1 |
| c) What is the significance of Prandtl number and Grashoff number? | 3 | 1 |
| d) Write about critical heat flux in boiling. | 4 | 1 |
| e) "Counter flow heat exchanger have better performance compared to parallel flow heat exchanger" Justify. | 5 | 2 |

PART-BAnswer *five* questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|---|----|---|---|
| 2. a) State the following | | | |
| i) Fourier's law of heat conduction ii) Newton's law of convection | 4M | 1 | 1 |
| b) Derive the general 3D heat conduction equation in Cartesian coordinates and reduce it different forms. | 8M | 1 | 2 |

OR

- | | | | |
|---|----|---|---|
| 3. a) Explain the different types of boundary conditions in heat transfer analysis. | 4M | 1 | 1 |
| b) Hot air at 100°C is blown over a 3-m by 6-m flat surface at 30°C. If the average convection heat transfer coefficient is 60 W/m ² °C, determine the rate of heat transfer from the air to the plate, in kW. | 8M | 1 | 3 |

UNIT-II

- | | | | |
|--|----|---|---|
| 4. a) Derive an expression for critical radius of insulation for a cylindrical system. | 4M | 2 | 2 |
| b) A composite hollow cylinder with inner and outer diameters equal to 2 cm and 4.5 cm is covered with two layers of insulation. First layer of insulation is 1 cm thick and second layer 0.5 cm thick. A fluid with 100°C is flowing through the inner pipe with convection coefficient of 60 W/m ² K. Extreme outer surface of the composite system is exposed to fluid at 40°C with convection coefficient of 12 W/m ² K. If the thermal conductivities of cylinder, insulation one and insulation two are equal to 10 W/mK, 1.4 W/mK and 0.54 W/mK respectively, calculate the heat transfer rate across the composite cylinder per meter length of the pipe and temperatures at the interfaces of the composite cylinder. | 8M | 2 | 3 |

OR

5. a) What is semi-infinite body? Define the error function and explain its significance in a semi-infinite body in transient state. 4M 2 1
- b) A leather slab 12 cm thick is initially at 40°C suddenly immersed in a cooling medium at 2°C for which the convection coefficient is 25.6 W/m²K. Determine the time at which the centerline temperature drops to 10°C and total heat transfer. The properties of leather are: $k = 0.75$ W/mK, $\rho = 1142$ kg/m³ and $C = 3540$ J/kgK. 8M 2 3

UNIT-III

6. a) Explain the concept of velocity and thermal boundary for internal flow through a circular pipe. 4M 3 1
- b) Air at atmospheric pressure and at a temperature of 30°C flows over a heated cylinder of 60 mm diameter whose surface is subjected to a constant temperature at 175 °C. Determine the lost of heat from the cylinder if the air velocity is 40 m/s. 8M 3 3

OR

7. a) Compare the variation of velocity and temperature along a vertical plate for the plate under natural convection and forced convection. 4M 3 1
- b) Consider forced convection through a circular pipe of diameter 'D'. Using Buckingham's theorem, obtain an expression for Nusselt number in terms of Re and Pr . 8M 3 2

UNIT-IV

8. a) Distinguish between filmwise and dropwise condensation. 6M 4 1
- b) A heated polished copper plate is immersed in a pool of water boiling at atmospheric pressure. If the surface temperature of the copper plate is maintained at a temperature of 120°C, determine the surface heat flux and the evaporation rate per unit area of the plate. 6M 4 3

OR

9. a) Define the following i) Radiation shape factor, ii) Intensity of radiation 4M 4 1
- b) Two large parallel planes with emissivities 0.4 and 0.78 maintained at 400°C and 600°C respectively are exchanging heat by radiation. Find the percentage reduction in heat transfer when a polished-aluminum radiation shield of emissivity 0.03 is between them. Also calculate the temperature of the radiation shield. 8M 4 3

UNIT-V

10. a) How are heat exchangers classified? 4M 5 1
- b) Water at the rate of 4140 kg/h is heated from 30°C to 80°C by an oil having a sp. Heat of 1890 J/kgK. The exchanger is of a counter flow double pipe design. The oil enters at 150°C and leaves at 100°C. Determine the area of the heat exchanger necessary to handle this load if the overall heat transfer coefficient is 343 W/m²K. 8M 5 3

OR

11. a) Discuss the advantages of NTU over LMTD method of heat exchanger design. 4M 5 1
- b) A single pass cross flow intercooler is used to cool 2.4 kg/s of air ($C_p = 1020$ J/kgK), at 123 °C with water flowing through the tubes at a rate of 2.56 kg/s. The water enter enters at 30°C and the overall heat transfer coefficient is 200W/m²K based on the outer tube surface area of 21 m². Using the NTU method estimate the exit temperature of water and air. 8M 5 3

*** End ***

Hall Ticket Number :									
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R-20

Code: 20A362T

III B.Tech. II Semester Regular Examinations June 2023

Metrology & Measurements
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

- Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B**)
 2. In Part-A, each question carries **Two marks**.
 3. Answer **ALL** the questions in **Part-A** and **Part-B**

PART-A

(Compulsory question)

- | | | | |
|---|------------------------|-----|----|
| 1. Answer all the following short answer questions | (5 X 2 = 10M) | CO | BL |
| a) Compare shaft basis system & hole basis system. | | CO1 | L2 |
| b) Write the limitations of sine bar. | | CO2 | L1 |
| c) List out the errors in screw threads. | | CO3 | L1 |
| d) Differentiate capacitance and resistance. | | CO4 | L2 |
| e) What are thermocouples? | | CO5 | L1 |

PART-B

Answer five questions by choosing one question from each unit (5 x 12 = 60 Marks)

Marks CO BL

UNIT-I

- | | | | |
|--|----|-----|----|
| 2. a) A hole and mating shaft are to have a nominal assembly size of 40 mm. The assembly is to have a maximum clearance of 0.15 mm and a minimum clearance of 0.05mm. The hole tolerance is 1.5 times the shaft tolerance. Determine the limits for both hole and shaft: By using (i) Hole basis system (ii) Shaft basis system. | 6M | CO1 | L3 |
| b) Classify limits. Explain them with the help of neat sketches. | 6M | CO1 | L2 |

OR

- | | | | |
|---|----|-----|----|
| 3. a) Explain the concept of Taylor's Principle in designing of gauges. | 6M | CO1 | L2 |
| b) Differentiate between plug gauges and ring gauges, with neat diagrams. | 6M | CO1 | L2 |

UNIT-II

- | | | | |
|---|----|-----|----|
| 4. a) What do you mean by line and end standards of length? Write down the characteristics of each of them. | 6M | CO2 | L2 |
| b) Explain the working principle in Dial indicator | 6M | CO2 | L2 |

OR

5. a) Explain the working principle of Sine Bar with neat sketch. 6M CO2 L2
 b) Illustrate the measurement of external taper of a shaft by using rollers/spheres. 6M CO2 L2

UNIT-III

6. a) Identify various methods of evaluating the primary texture and explain them in detail. 6M CO3 L3
 b) With the help of a neat diagram describe the construction and working of the Talysurf instrument. 6M CO3 L2

OR

7. a) Explain with a neat sketch the measurement of chordal thickness of a spur gear tooth. 6M CO3 L2
 b) Explain the construction and working of Gear tooth vernier. 6M CO3 L2

UNIT-IV

8. a) What is a transducer? Explain the working of Variable Capacitance transducer. 6M CO4 L2
 b) With a neat sketch explain the Stroboscope tachometer. 6M CO4 L2

OR

9. a) Differentiate between Piezoelectric and Photo electric transducer. 6M CO4 L2
 b) Describe the working of any one speed measuring device with a neat sketch. 6M CO4 L2

UNIT-V

10. a) What are resistance thermometers? What are the advantages and disadvantages of resistance thermometers (RTD)? 6M CO5 L2
 b) With a neat sketch explain the dead weight gauge for pressure measurement. 6M CO5 L2

OR

11. a) Explain the principle of measuring shaft torque using optical torsion meter. 6M CO5 L2
 b) With a neat sketch explain the working principle of Bimetallic thermometer. 6M CO5 L2

*** End ***