5E1321

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B. Tech. V - Sem. (Main / Back) Exam., January - 2022
ESC Automobile Engineering
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [5×2=10]

All questions are compulsory

Q.1 What do you mean by Mechatronic system?

Q.2 Differentiate between open loop and closed loop control system.

Q.3 Write the selection criteria for sensors.

Q.4 What do you mean by Packaging system?

Q.5 What is data logger?

PART – B

(Analytical/Problem solving questions) [4×10=40]

Attempt any four questions

Q.1 Explain the basics of micro and nanotechnology including their applications.

Q.2 Explain the principle of operation of the variable reluctance stepper motor.

Q.3 Explain the construction and working of Bipolar Junction Transistor.

Q.4 Draw and explain the block diagram of 8085 microprocessor.

Q.5 Explain application on real-time industrial automation system using PLC.

Q.6 Explain in detail CNC lathe, describing its working and control methods.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]

Attempt any two questions

Q.1 What are the operation used in control system? Also explain the control system for mechatronic application.

Q.2 Write short notes on the following –

(a) BLDC Motor

(b) PID Controller

(c) Signal Conditioning

Q.3 Give classification of sensor and transducer. List the main characteristics of generally used transducer.

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B. Tech. V - Sem. (Main / Back) Exam., January - 2022

Automobile Engineering

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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. Heat Transfer Data Book   2. NIL

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1   What is the difference between homogeneous and isotropic material?

Q.2   Define thermal contact resistance with a suitable sketch.

Q.3   Describe the selection criteria of heat exchanger.

Q.4   What do you understand by transient heat transfer?

Q.5   Describe the significance of non-dimensional numbers.

Q.6   Write down the difference between thermodynamics and heat transfer.

Q.7   Define film wise condensation.

Q.8 Write down the assumptions of Fourier's law.

Q.9 How Reynolds number is selected for dynamic similarity?

Q.10 What is infinite plate in analysis of transient heat conduction?

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 Write short note on –

  (i)   Reynolds Number

  (ii)   Biot Number

  (iii) Grashof Number

  (iv) Euler Number

Q.2 What is heat exchanger? Explain different types of heat exchanger with a neat sketch.

Q.3 Define the following -

  (i)   Stefan-Boltzmann law

  (ii)   Kirchhoff's law

  (iii) Wien's displacement law

  (iv) Planck's law

Q.4 What is critical thickness of insulation? Derive the relation of critical thickness of insulation for cylinder.

Q.5 Using dimensional analysis obtain an expression for Nusselt number in terms of Reynold and Prandtl number.

Q.6 A light oil with 20°C inlet temperature flow at the rate of 500 kg/min through 5cm inner diameter pipe which is enclosed by a jacket containing condensing steam at 150°C. If the pipe is 5m long find out the outlet temprature of oil.

Q.7 Calculate the heat transfer area required for a 1-1 shell and tube heat exchanger which is used to cool 55,000 kg/hr of alcohol form 66°C to 40°C using 40,000 kg/hr of water entering at 5 °C. Consider –

(i) Counter flow

(ii) Parallel flow U = 580 W/m^{2}K

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [4×15=60]

Attempt any four questions

Q.1 (i) Show that $Q_{fin} = \sqrt{(PhkA_{cs})} \times (t_0 - t_a) \times [\tan h (ml)]$ for fin insulated at the tip.

(ii) Explain lumped parameter analysis and also derive the relation of temperature for lumped body.

Q.2 (i) Two large parallel plates with emissivity of 0.5 each are maintained at different temperatures and are exchanging heat only by radiation. Two equally large radiation shields with emissivity of 0.05 are introduced in parallel to the plates. Find the percentage reduction in net radiative heat transfer.

(ii) A thermo couple junction, who may be approximated as a sphere, is to be used for temperature measurement in a gas steam. The convection coefficient between the junction surface and the gas is h = 400 W/m^{2}K and the junction thermo physical properties are k = 20 W/mK, C = 400 J/kgK and ρ = 8500 kg/m^3. Determine the junction diameter needed for the thermocouple to have a time constant of 1 sec. If the junction is at 25°C and placed in a gas stream that is at 200°C. How long it will take for the junction to reach 199°C?

Q.3 (i) Derive the general heat conduction equation in spherical coordinate system.

(ii) Write down the general heat conduction equation in Cartesian coordinate system and cylindrical coordinate system.

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Q.4 (i) Derive an expression for LMTD of counter flow heat exchanger.

(ii) Derive an expression for effectiveness of counter flow heat exchanger.

Q.5 (i) A flat plate, 1 m wide and 1.5 m long is to be maintained at 90°C in air with a free stream temperature of 10°C. Determine the velocity which air must flow over flat plate along 1.5 m side so that the rate of energy dissipation from the plate is 3.75kW. Take the following properties of air at 50°C; $\rho = 1.09$ kg/m³, k = 0.028 W/m°C, $C_p = 1.007$ kJ/kg°C, $\mu = 2.03 \times 10^{-5}$ kg/m-s and Pr = 0.7.

(ii) Write short note on –

(a) Radiation shield

(b) Shape factor

(c) Grey body

(d) Reciprocal theorem

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B. Tech. V - Sem. (Main / Back) Exam., January - 2022
Automobile Engineering
5AE4 – 03 Manufacturing Technology
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 What is Machinability Index?

Q.2 What are the main factors which influence the tool life?

Q.3 Why Lathe beds are made of cast iron?

Q.4 What is built-up-edge (BUE)?

Q.5 What is broaching?

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Q.6 What are the basic requirements for the selection of a specific cutting fluid?

Q.7 How are the cutting tools classified?

Q.8 What are the popular tool designation system in common use?

Q.9 Why truing and dressing are necessary in grinding wheels?

Q.10 Which materials are used in the manufacturing of grinding wheels?

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 Derive an expressions for the cutting ratio, also draw Merchant's circle diagram and show that forces and angles on the cutting tool and different parameters involved in metal cutting.

Q.2 What is the difference between a Capstan and Turret Lathe? Explain Turret Lathe with suitable diagram.

Q.3 A HSS tool is used for turning operation. The tool life is one hour when turning at 30 m/min, but reduces to 2 min if cutting speed is doubled. Find the suitable RPM for turning a 300 mm diameter rod so that tool life is 30 min.

Q.4 Explain lapping operation with a suitable diagram.

Q.5 What are the high velocity forming methods? Explain Electro-hydraulic forming in detail.

Q.6 What are the types of cutting tool wear patterns observed in single point cutting tools? How do they affects the metal cutting performance?

Q.7 Describe step by step process of gear cutting by gear hobbing process with suitable figure.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [4×15=60]

Attempt any four questions

Q.1 In an orthogonal cutting operation chip thickness ratio is 0.4 and depth of cut is 0.5 mm, rake angle of tool is 7°. Determine –

   (i)   Chip thickness

   (ii)   Shear plane angle

Q.2 Explain the geometry of a single point cutting tool and explain functions of various tool angles.

Q.3 Explain magnetic pulse forming method with suitable diagram.

Q.4 Determine the optimum cutting speed for an operation on a lathe machine using the following information –

   Tool change time = 3 min

   Tool regrind time = 3 min

   Machine running cost ₹ 0.50 per min.

   Depreciation of tool regrind ₹ 5.0 and

   The constants in the tool life equation are 60 and 0.2.

Q.5 Explain the basis for the selection of a specific cutting fluid for a given application. Take the example of turning, milling and grinding and suggest the type of cutting fluid used.

5E1324

B. Tech. V - Sem. (Main / Back) Exam., January - 2022
Automobile Engineering
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. Design Data Book   2. NIL

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 State the scope of the course, design of machine elements.

Q.2 How will you designate plain carbon steels?

Q.3 Briefly explain the principle of design for assembly.

Q.4 What do you mean by economics and design process?

Q.5 Explain the endurance strength of material.

Q.6 List the causes of stress concentration in a component.

Q.7 Distinguish clearly between direct stress and bending stress.

Q.8 What is the effect of keyway cut into the shaft?

Q.9 List the requirements of a good shaft coupling.

Q.10 What does a bolt of M 24 × 2 means?

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 What are the preferred numbers? Discuss its uses.

Q.2 The dimensions of the mating parts, according to basic hole system, are as follows-

HOLE:	25.03 mm	SHAFT:	25.02 mm
	24.97 mm		24.98 mm

Evaluate hole tolerance, shaft tolerance and allowance.

Q.3 How a cotter joint is made? Discuss the applications of a cotter joint.

Q.4 What is meant by stress concentration? How it can be reduced?

Q.5 A truck spring has 12 number of leaves, two of which are full length leaves. The spring supports are 1.05 m apart and the central band is 85 mm wide. The central load is to be 5.4 kN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the spring 3.

Q.6 A solid shaft is transmitting 1 MW at 240 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 60 MPa.

Q.7 A bracket as shown in figure supports a load of 30 kN. Determine the size of bolts, if the maximum allowable tensile stress in the bolt material is 60 MPa. The distances are: $L_1 = 80$ mm, $L_2 = 250$ mm and $L_3 = 500$ mm.
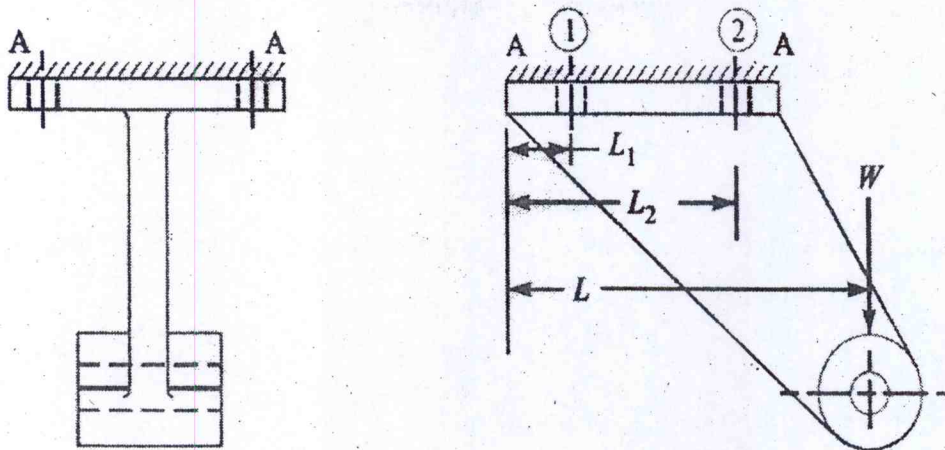
PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [4×15=60]

Attempt any four questions

Q.1 Find the maximum stress induced in the following cases taking stress concentration into account -

(i) A rectangular plate 60 mm × 10 mm with a hole 12 mm diameter as shown in figure (a) and subjected to a tensile load of 12 kN.

(ii) A stepped shaft as shown in figure (b) and carrying a tensile load of 12 kN.

(a)

(b)

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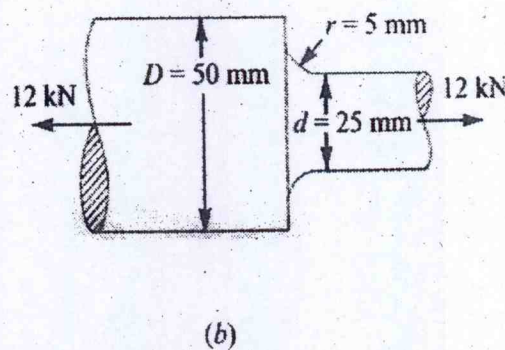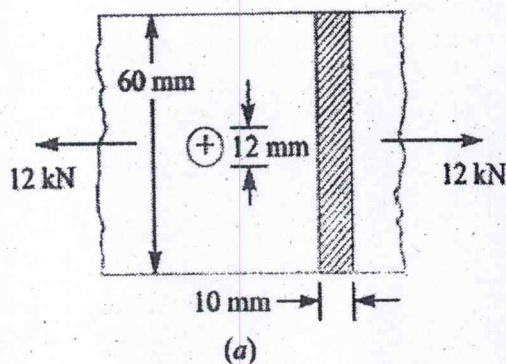
Q.2 Design a muff coupling which is used to connect two steel shafts transmitting 40 kW at 350 rpm. The material for the shafts and key is plain carbon steel for which allowable shear and crushing stresses may be taken as 40 MPa and 80 MPa respectively. The material for the muff is cast iron for which the allowable shear stress may be assumed as 15 MPa.

Q.3 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.

Q.4 Give in detail, the design procedure of screw jack.

Q.5 Write short notes on any three -

(i)   Mechanical properties of engineering materials

(ii) Bolt of uniform strength

(iii) Design for stiffness

(iv) Design for strength

5E1325

5E1325

B. Tech. V - Sem. (Main / Back) Exam., January - 2022
PCC/ PEC Automobile Engineering
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [5×2=10]

All questions are compulsory

Q.1 Explain behavioral thoughts of management.

Q.2 Define organizational structure of management.

Q.3 Explain Human Resource Management and Selection method.

Q.4 Define Group Decision Making in management.

Q.5 Write management practices skills and operation management.

PART – B

(Analytical/Problem solving questions) [4×10=40]
Attempt any four questions

Q.1 Write contribution of management thinkers of Fayol?

Q.2 Define TQM and its principles.

Q.3 Define Line/Staff authority in management.

Q.4 Explain effective organizing and culture in management.

Q.5 Explain controlling process in management.

Q.6 Define system and contingency in management.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions) [2×15=30]
Attempt any two questions

Q.1 Explain organizational structure of any 10 companies and classifying them into different

types of organization.

Q.2 Explain management practices of Narayan Murthy.

Q.3 Prepare the leadership profile of any one business leader and their qualities.

5E1326

5E1326

5E1326

B. Tech. V - Sem. (Main / Back) Exam., January - 2022
Automobile Engineering
5AE5 – 11 Steam Engineering
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. __NIL__   2. __NIL__

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 What are the functions of steam drum?

Q.2 What is the purpose of bleeding in a steam turbine?

Q.3 Write any five types of high pressure boilers.

Q.4 Differentiate between Air pre-heater and Economizer.

Q.5 What is meant by nozzle governing?

Q.6 What is the significance of stagnation properties?

Q.7 Differentiate between Impulse and Reaction turbine.

Q.8 What is Degree of reaction?

Q.9 Explain briefly about by-product power cycle.

Q.10 Enlist various types of condenser.

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 Differentiate between Natural and Forced circulation boilers.

Q.2 A convergent-divergent nozzle expands steam from 14 bar and 300°C to 6 bar. If the flow rate is 1 kg/s. Find the throat and exit area. What should be the coefficient of velocity if the exit velocity is 550 m/s?

Q.3 Explain the purpose of reheating in a steam turbine.

Q.4 Derive the expression for efficiency in case of reaction turbine and explain why reaction turbine is called as 50% reaction turbine.

Q.5 What is the importance of Mach number in the design of diffusers and nozzles? Verify your answer with the help of any example.

Q.6 Explain the difference between ideal and actual regenerative cycles by showing the process on T-s and h-s diagram.

Q.7 Explain the working of binary vapour cycles with the help of suitable diagrams.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [4×15=60]

Attempt any four questions

Q.1 Describe the various types of artificial draught systems used in steam boilers indicating their main advantages.

Q.2 Explain the physical significance of Choked flow. Discuss about the flow through convergent-divergent nozzle.

Q.3 Derive the condition for maximum efficiency of an impulse turbine.

Q.4 At a particular ring of a reaction turbine, the blade speed is 67 m/s and the flow of steam is 4.56 kg/s, dry saturated at 1.403 bar. Both fixed and moving blades have inlet and exit angles 40° and 30° respectively. Determine –

(a)   Power developed by the pair of rings

(b)   The required blade height which is to be one tenth of the mean blade ring diameter

(c)   The heat drop required by the pair if the steam expands with an efficiency of 80%

Q.5 Steam is supplied to a turbine at a pressure of 30 bar and a temperature of 450°C. If the steam is reheated at 5 bar to a temperature of 400°C and then expands isentropically to a pressure of 0.1 bar. Calculate the thermal efficiency of the cycle and condition of steam at turbine outlet.

5E1327

B. Tech. V - Sem. (Main / Back) Exam., January - 2022
Automobile Engineering
5AE5 – 12 Automobile Engineering
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 from Part C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 What are the functions of frame?

Q.2 What are the main causes of clutch noise?

Q.3 What is the principle of synchromesh gearbox?

Q.4 What is Caster?

Q.5 What is the basic principle of Air-braking system?

Q.6 What is the essential difference between the magneto and the coil ignition system?

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Q.7 What is the necessity of a propeller shaft?

Q.8 State any four factors which influence tyre treads contact with the road surface?

Q.9 Why is frame narrowed at the front?

Q.10 What is 'Capacity' of a battery?

PART – B

(Analytical/Problem solving questions)   [5×8=40]

Attempt any five questions

Q.1 Enumerate the components of a suspension system and state their functions in brief.

Q.2 Explain the working of centrifugal clutch with a suitable sketch.

Q.3 Explain briefly, two types of construction of propeller shaft -

   (i)   Torque tube propeller shaft

   (ii)   Hotchkiss type propeller shaft

Q.4 What do you understand by ignition timing? Enumerate the various factor which affects ignition timing.

Q.5 Explain briefly the following steering gear mechanism -

   (i)   Davis steering gear

   (ii)   Ackermann steering gear

Q.6 Explain the following terms -

   (i)   Battery voltage

   (ii)   Battery capacity

   (iii) Battery efficiency

   (iv)   Battery rating

Q.7 Explain briefly, the main considerations for safety of an automobile.

PART – C

Q.1 Why is gearbox necessary in motor car? Draw a neat sketch of a gearbox that is normally used in a heavy-duty commercial vehicle and explain its actions.

Q.2 Give technical specifications in details of any four commonly used cars in India.

Q.3 Explain the following terms related to hydraulic brakes with suitable sketches -

   (i)   Bleeding of brakes

   (ii)   Hill Holder

   (iii) Self-energizing brakes

Q.4 What is the basic difference between the chassis and frame? Give the main functions of chassis and frames. Explain various types of frames with a neat sketch also briefly explain various defects which found in chassis frame.

Q.5 Explain the following with neat sketch -

   (i)   Fluid coupling

   (ii)   Hydraulic torque converter

   (iii) Mechanical clutch linkage

   (iv)   Hydraulic clutch linkage

5E1328

B. Tech. V - Sem. (Main / Back) Exam., March - 2022
Automobile Engineering
5AE5 – 13 Non Destructive Evaluation & Testing
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 from Part C.*

Schematic diagrams must be shown wherever necessary. Any data you feel missing may 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. NIL _____   2. NIL _____

PART – A

(Answer should be given up to 25 words only)   [10×2=20]

All questions are compulsory

Q.1 What are the disadvantages of Ultrasonic testing?

Q.2 Enumerate the limitation of radiographic inspection.

Q.3 State two applications of Radiography.

Q.4 What are the objectives of NDT?

Q.5 Write short note on Holography.

Q.6 State the limitations of eddy current testing.

Q.7 List out the method of producing gamma rays.

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Q.8 State the principle of Magnetic Particle test.

Q.9 Give the application of Non-destructive evaluation.

Q.10 What are the various components of magnetic non-destructive test?

PART – B

(Analytical/Problem solving questions)   [5×8=40]
Attempt any five questions

Q.1 Explain about sources of X and Gamma rays and their interaction with matter in detail.

Q.2 What is Ultrasonic Testing (UT)? Explain pulse echo method of UT.

Q.3 What are the safety norms in industrial radiography? Write its method application.

Q.4 What is the principle of Eddy current testing? List out its application.

Q.5 Explain about standardization, calibration, interpretation and evaluation of magnetic particle test.

Q.6 Explain the flow analysis of pressure vessels in NDT.

Q.7 What is Holography? Explain x-rays holography techniques.

PART – C

(Descriptive/Analytical/Problem Solving/Design Questions)   [4×15=60]
Attempt any four questions

Q.1 Explain about the application of NDE in costing and welded constructions.

Q.2 (a) Write a brief note on radiographic film and its processing.

(b) Write down the sensitometric characteristics of x-ray films.

Q.3 (a) Explain eddy current testing method. What is sensitivity in ECT?

(b) Explain the single frequency and multi frequency eddy current testing.

Q.4 Write short notes on –

(a) Straight beam

(b) Angle beam

Q.5 Explain phenomenon of photographic latent image. Discuss radiation protection technique.

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5E6201

5E6201

B. Tech. V - Sem. (Mercy Back) Exam., March - 2022
Automobile Engineering
5AE1A Heat Transfer
AE, ME

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.** All questions carry **equal** marks. 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. NIL _____ 2. NIL _____

UNIT- I

Q.1 (a) Define and distinguish between - [8]

   (i) Steady state

   (ii) Unsteady state

   (iii) Transient state of heat transfer

   (b) Distinguish between the conduction, convection and radiation modes of heat transfer. [8]

OR

Q.1 A solar plane 1m × 1.25m, receives solar radiation 1500 Watts. Calculate surface temperature of the plane if the ambient temperature is 25°C and the convective heat transfer coefficient of the air film over the surface of plane is 12.5 W/m² deg. [16]

UNIT- II

Q.2 (a) What is the utility of extended surface? [8]

(b) Under what condition does the fin efficiency becomes nearly 100%? [8]

OR

Q.2 (a) Give a general equation for the rate of heat transfer by convection and hence define the coefficient of heat transfer. [8]

(b) Define Nusselt number. How it is related to temperature gradient in the fluid immediately in contact with the solid surface? [8]

UNIT- III

Q.3 (a) What is a dimensionless number? How and why are they used in heat transfer? [8]

(b) What do you understand by the hydrodynamic and thermal boundary layer? Illustrate with reference to flow over a flat heated plate. [8]

OR

Q.3 A smooth rectangular plate 1.25 m wide × 25 m long moves through water in the direction of its length. The drag force on two sides of the plate is estimated to be 900 kg. Calculate : [16]

(i) Velocity with which the plate moves

(ii) Boundary layer thickness at the trailing edge of the plate

(iii) Distance X_c at which the laminar boundary layer transforms into turbulent boundary layer. For water $\rho = 1000$ kg/m^3 and $V = 1 \times 10^{-6}$ m^2/s.

UNIT- IV

Q.4 (a) Define the term overall heat transfer coefficient. [6]

(b) What is heat exchanger? How heat exchangers are classified? [6]

(c) Sketch a shell and tube type heat exchange. [4]

OR

Q.4 Two fluids pass through a heat exchanger, the cold fluid is heated from 40°C to 90°C while the hot fluid in cooled from 200°C to 100°C -

(a) What % saving in surface area is made by using a counter flow exchanger instead of a parallel flow?

(b) What are the temperature of the two fluid at the middle of the exchanger for parallel flow arrangement? [16]

UNIT- V

Q.5 (a) What do you understand by 'radiation shape factor'? How is it used in analysis of radiation heat transfer problem? [8]

(b) Classify different types of boiling. [8]

OR

Q.5 Derive a general relation for the radiation shape factor in case of radiation between two surface. [16]

5E6202

B. Tech. V - Sem. (Mercy Back) Exam., March - 2022
Mechanical Engineering
5ME2A Dynamics of Machines
AE, ME

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. 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. NIL _____   2. NIL _____

UNIT- I

Q.1 (a) A Porter governor has equal arms each 250 mm long and pivoted on the axis of rotation. Each ball has a mass of 5 kg and the mass of the central load on the sleeve is 25 kg. The radius of rotation of the ball is 150 mm when the governor begins to lift and 200 mm when the governor is at maximum speed. Find minimum and maximum speed and range of speed of the governor. [10]

(b) Derive an expression for effort and power of a porter governor. [6]

OR

Q.1 (a) Explain the term height of the governor. Derive an expression for the height in case of watt governor. [8]

(b) Define and explain the following terms related to governor - [2×4=8]

   (i)   Stability

   (ii) Sensitiveness

   (iii) Isochronism

   (iv) Hunting

UNIT- II

Q.2 (a) Describe the Gyroscopic effect on sea-going vessel. [8]

   (b) Discuss the effect of gyroscopic couple on a two – wheeled vehicle when taking a turn. [8]

OR

Q.2 (a) What is the difference between piston effort, crank effort and crank-pin effort? [6]

   (b) A vertical double acting steam engine has a cylinder 300 mm diameter and 450 mm stroke and runs at 200 rpm. The reciprocating parts has a mass of 225 kg and the piston rod is 50 mm diameter. The connecting rod is 1.2 m long. When the crank has turned through 125° from top dead centre, the steam pressure above piston is 30 kN/m^2 and below piston is 1.5 kN/m^2. Calculate the effective turning moment on crank – shaft. [10]

UNIT- III

Q.3 (a) Derive a relation for a minimum number of teeth for rack and pinion arrangement to avoid interference. [8]

   (b) Define the law of gearing. Show that involute profile satisfy the conditions for correct gearing. [8]

OR

Q.3 A pair of 20° full depth involute spur gears having 30 and 50 teeth respectively of module 4 mm are in mesh. The smaller gear rotates at 1000 rpm. Determine - [16]

   (a) Sliding velocity at engagement and disengagement of pair of teeth

   (b) Contact ratio

UNIT- IV

Q.4 (a) Discuss the speed ratio of a compound gear train. [8]

(b) Explain the working of constant mesh gearbox. [8]

OR

Q.4 (a) Explain briefly the differences between simple, compound and epicyclic gear trains. What are the advantages of epicyclic gear train? [8]

(b) An epicyclic gear consists of three gears A, B and C. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C and carried on an arm EF. Which rotates about centre of A at 18 rpm? If gear A is fixed, determine speed of gear B and C - [8]
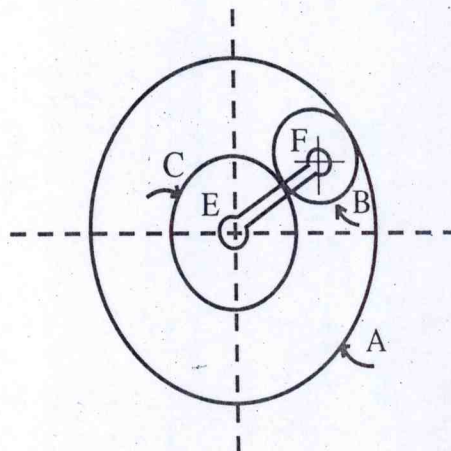
UNIT- V

Q.5 (a) Write short note on primary and secondary balancing. [8]

(b) Explain static and dynamic balancing state necessary conditions to achieve them. [8]

OR

Q.5 (a) Deduce expression for variation in tractive force, swaying couple and hammer blow for an uncoupled two - cylinder locomotive engine. [10]

(b) Explain the method of balancing of different masses revolving in same plane. [6]

5E6203

5E6203

B. Tech. V - Sem. (Back) Exam., March - 2022
Mechanical Engineering
5ME3A Measurement and Metrology
ME, PI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. 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. NIL _____   2. NIL _____

UNIT- I

Q.1 (a) Explain accuracy and precision with suitable examples. [8]

(b) Explain Sensitivity and Readability. [8]

OR

Q.1 (a) Explain the following -

(i) Calibration [4]

(ii) Repeatability and reproducibility [4]

(b) Describe the various types of errors in measurement. [8]

UNIT- II

Q.2 Enlist various types of Gauges. Explain Gauge design and application of limit Gauges with suitable example. [16]

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<div align="center">OR</div>

Q.2 Explain the following -

    (a)   Pneumatic Comparator [4]

    (b)   Bevel Protractor [4]

    (c)   Autocollimator [4]

    (d)   Micrometer [4]

<div align="center"><h2>UNIT- III</h2></div>

Q.3 (a) Explain 3 – wire method of measuring effective diameter of screw thread. [8]

    (b) What is progressive error in screw threads? [4]

    (c) Explain Parkinson gear tester. [4]

<div align="center">OR</div>

Q.3 (a) Briefly explain the step by step procedure for determining the flatness of a surface with a neat sketch. [8]

    (b) Explain with a neat diagram the measurement of straightness using autocollimator.[8]

<div align="center"><h2>UNIT- IV</h2></div>

Q.4 (a) Explain the working principle of a DC Laser interferometer with a neat diagram. [8]

    (b) Explain the laser and led based distance measuring instruments. [8]

<div align="center">OR</div>

Q.4 (a) Mention the advantages and disadvantages of CMM. [8]

    (b) Explain the construction details of column type CMM. [8]

<div align="center"><h2>UNIT- V</h2></div>

Q.5 (a) Explain the torque measurement using strain gauges. [8]

    (b) Explain the torque measurement using torsion bars. [8]

<div align="center">OR</div>

Q.5 (a) Explain the method of measuring force using a strain gauge load cell. [8]

    (b) Explain the Accelerometer and Bourdon tube. [8]

5E6204

B. Tech. V - Sem. (Back) Exam., March - 2022
Mechanical Engineering
5ME4A Quality Assurance and Reliability

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions,** selecting **one question** from **each unit.**
All questions carry **equal** marks. 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. Probability Tables   2.   NIL

UNIT- I

Q.1 (a) Define quality and describe the dimensions of quality.   [8]

(b) A lot of 20 transistors contains 5 non-conforming ones. If an inspector randomly samples 4 items, find the probability of 3 non-conforming transistors.   [4]

(c) The length of a machined part is known to have a normal distribution with a mean of 100 mm and a standard deviation of 2 mm. What proportion of parts will be above 103.3 mm?

(Given $P (z \leq 1.65) = 0.9505$)   [4]

OR

Q.1 (a) Explain quality objectives and quality policy and enumerate guidelines for framing the same.   [8]

(b) A manufacturing process is estimated to produce 5% non-conforming items. If a random sample of five items is chosen, find the probability of getting two non-conforming items.   [4]

(c) It is known that a battery for a video game has an average life of 500 hours (h). The failures of batteries are known to be random and independent and may be described by an exponential distribution. Find the probability that a battery will last atleast 600 hours.   [4]

UNIT- II

Q.2 (a) Define, what do you mean by chance causes and assignable causes and compare them?   [8]

(b) The thickness of the magnetic coating on audio tapes is a characteristic of interest. Random samples of size 4 are selected and the thickness is measured using an optical instrument. Table -1 below shows the mean $\bar{x}$ and standard deviation 's' for 20 samples. The specifications are 38 ± 4.5 microns. Find the trial control limits for $\bar{x}$ and 's' chart and draw trial control chart.   [8]

and inter whether the process is in control

(Given B_4=2.266, B_3=0, A_3= 1.628)

Table -1 Data for magnetic coating thickness –

Sample No.	Sample Mean	Sample Standard Deviation	Sample No.	Sample Mean	Sample Standard Deviation
1	36.4	4.6	11	36.7	5.3
2	35.8	3.7	12	35.2	3.5
3	37.3	5.2	13	38.8	4.7
4	33.9	4.3	14	39.0	5.6
5	37.8	4.4	15	35.5	5.0
6	36.1	3.9	16	37.1	4.1
7	38.6	5.0	17	38.3	5.6
8	39.4	6.1	18	39.2	4.8
9	34.4	4.1	19	36.8	4.7
10	39.5	5.8	20	37.7	5.4

OR

Q.2 (a) Describe the 'Magnificent Seven' tools for statistical process control.   [8]

(b) Table-2 shows the Brinell Hardness numbers of 20 individual steel fasteners the testing process dents the parts so that they cannot be used for their intended purpose. Construct and draw (plot) the x-chart and the MR chart based on two successive observations. (Specification limits are 32 ± 7, $D_4 = 3.267$, and $D_3 = 0$)   [8]

Table-2 Brinell Hardness Data for individual fastners –

Sample No.	Brinell Hardness		Sample No.	Brinell Hardness
1	36.3		11	29.4
2	28.6		12	35.2
3	32.5		13	37.7
4	38.7		14	27.5
5	35.4		15	28.4
6	27.3		16	33.6
7	37.2		17	28.5
8	36.4		18	36.2
9	38.3		19	32.7
10	30.5		20	28.3

UNIT- III

Q.3 (a) Describe demerit system and enumerate the formula for calculating center line, upper control limit and lower control limit for demerits per unit.   [8]

(b) Twenty five samples of size 50 are chosen from a plastic injection moulding machine producing small bottles. The number of non-conforming bottles for each sample is shown in Table-3 below. Calculate centre line, upper control limit & lower control limit for proportion of non-conforming items (p-chart) and construct p-chart. Also calculate revised control limits if the process is not in control by plotting trial control chart. [8]

Table-3 Data for non-conforming bottles (n=50)

Sample No.	Number of non-conforming items	Sample No.	Number of non-conforming items	Sample No.	Number of non-conforming items
1	4	9	5	17	4
2	2	10	4	18	10
3	5	11	3	19	4
4	3	12	5	20	3
5	2	13	5	21	2
6	1	14	2	22	5
7	3	15	3	23	4
8	2	16	2	24	3
				25	4

OR

Q.3 (a) Compare the control charts for variables and attributes and also enumerate guidelines for their choice/use. [8]

(b) Samples of fabric from a textile mill, each 100 m² are selected and the number of occurrences of foreign matter are recorded data for 25 samples are shown in the Table - 4 construct a c-chart for the number of non-conformities. [8]

Table - 4 Foreign Matter Data – (sample size = 100 m²)

Sample No.	Non-conformities	Sample No.	Non-conformities	Sample No.	Non-conformities
1	5	9	16	17	7
2	4	10	10	18	6
3	7	11	9	19	10
4	6	12	7	20	8
5	8	13	8	21	9
6	5	14	11	22	9
7	6	15	9	23	7
8	5	16	5	24	5
				25	7

UNIT- IV

Q.4 (a) Write short notes on the following -

    (i) Quality assurance [3]

    (ii) Quality rating [3]

    (iii) Quality audit [4]

(b) Find a single sampling plan that satisfies a producer's risk of 5% for lots that are 1.5% non-conforming. Assume acceptance number C=1, C=3 & C=4. [6]

Given $np_1 = 0.355$ for C=1

             $np_3 = 1.366$ for C=3

             $np_6 = 3.286$ for C=6

OR

Q.4 (a) Explain what do you mean by ISO 14001 : 2004. Enumerate various clauses of this international standard. [10]

(b) Explain the working of a double sampling plan where $n_1 = 60$, $c_1 = 1$, $r_1 = 5$ and $n_2 = 100$, $c_2 = 5$, & $r_2 = 6$. [6]

UNIT- V

Q.5 (a) Explain the Bathtub curve for depicting equipment failure rate.   [8]

   (b) Explain -

      (i)   Reliability   [2]

      (ii) MTBF   [2]

   (c) A module of a satellite monitoring system has 500 components in series. The reliability of each component is 0.999. Find the reliability of the module. If the number of components in series is reduced to 200, what is the reliability of the module?   [4]

OR

Q.5 (a) Explain the three phases of the Taguchi method of experimental design.   [4]

   (b) Explain Quality Loss function.   [4]

   (c) Find the reliability of the system with three components (A, B and C) in parallel. The reliabilities of A, B and C are 0.95, 0.92 and 0.90 respectively.   [8]

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5E6205

5E6205
B. Tech. V - Sem. (Back) Exam., March - 2022
Production & Industrial Engineering
5PI5A Sociology and Economics for Engineers
AE, ME, PI

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting one **question** from **each unit**. All questions carry **equal** marks. 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. NIL _____   2. NIL _____

UNIT- I

Q.1 What is the concept of social system? Write a note on state and civil society.   [16]

OR

Q.1 Define social development. Critically discuss the nature of social development.   [16]

UNIT- II

Q.2 Write a note on-

   (a) Urban society   [8]

   (b) Tribal society   [8]

OR

Q.2 (a) 'A key part of the social and economic structure is an Organization.' Explain.   [8]

   (b) What are the social exclusion and inclusion processes?   [8]

UNIT- III

Q.3 (a) Discuss different form of market structure. [8]

(b) Define monopoly. Explain, how price is determined under monopoly? [8]

OR

Q.3 What are macroeconomic concepts and identities for closed and open economics? Explain the terms GNP, GDP, NI, PI and DI. [16]

UNIT- IV

Q.4 What are the fiscal policy tools? How does it impact on the economy? [16]

OR

Q.4 What is the role of Commercial Banks in developing countries? [16]

UNIT- V

Q.5 (a) Write a note on employment condition in organized and unorganized sectors of India.

[8]

(b) What are the challenges and policy debates in monetary sectors? [8]

OR

Q.5 (a) Discuss the economic growth in post reform India. [8]

(b) Write a note on the structure of productive activity. [8]

5E6207

B. Tech. V - Sem. (Back) Exam., March - 2022
Mechanical Engineering
5ME6.2A Automobile Engineering

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions to Candidates:

*Attempt any **five questions**, selecting **one question** from **each unit.** All questions carry **equal** marks. 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. NIL _____   2. NIL _____

UNIT- I

Q.1 (a) Explain layout of chassis. What are different types of chassis frames? Explain their construction features in brief. [2+6=8]

(b) Describe hydraulic clutches & their working with a neat sketch. [8]

OR

Q.1 (a) Explain construction & working of Multi-plate clutches with a neat sketch. Mention the application where it is use. [8]

(b) Explain Mechanical brakes in brief. Write about the materials used for making brake shoes & lining. [5+3=8]

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UNIT- II

Q.2 (a) Draw a simple diagram to show the layout of Epicyclic gearbox. Explain its working in detail. [8]

   (b) Write short notes on (any two) - [2×4=8]

   (i) Propeller shaft

   (ii) Differential

   (iii) Rear Axle types

OR

Q.2 (a) Explain constant Mesh gearbox in detail. Explain its working to show 5 forward & 1 reverse speed with neat sketch. [8]

   (b) Write short notes on (any two) - [2×4=8]

   (i) Torque tube drive

   (ii) All wheel drive

   (iii) Overdrive

UNIT- III

Q.3 (a) Explain Tyre Wear. What are its causes? How tyre over inflation & deflation effect the tyre. Describe in brief. [2+3+3=8]

   (b) Write short notes on (any two) - [2×4=8]

   (i) Camber & its effect on vehicle

   (ii) Types of Steering gear boxes

   (iii) Power steering

OR

Q.3 (a) Explain dependent & independent suspension system in brief. What are the advantages

of independent suspension system? [6+2=8]

(b) Write short notes on (any two) - [2×4=8]

(i) Retreading of tyre

(ii) Toe-in & Toe-out

(iii) Objectives of suspension system

UNIT- IV

Q.4 (a) How starter motor works? What are the different types of starter motor drives? Explain

any one in detail. [2+2+4=8]

(b) What do you mean by ignition system? Explain coil ignition system & its components

in detail. [2+6=8]

OR

Q.4 Write short notes on (any four) - [4×4=16]

(a) Charging & testing of batteries

(b) Construction of alternator

(c) Head lamp

(d) Fuel level indicator

(e) Electric horn

UNIT- V

Q.5 (a) What is Automotive Air Conditioning? Explain AC system components & their working with neat sketch? [2+6=8]

(b) What do you mean by term 'Automotive safety'? What are the requirements of safety? Name different safety methods used in Automobile. [2+3+3=8]

OR

Q.5 Write short notes on (any four) - [4×4=16]

(a) Types of Refrigerants

(b) Common faults in AC

(c) Night Vision System (NVS)

(d) Global Positioning System (GPS)

(e) Different types of Load on AC