

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1321****5E1321****B.Tech. V Semester (Main) Examination, Nov. - 2019****ESC Mechanical Engg.****5ME3-01 Mechatronic Systems****(Common For ME,AE)****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 suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

**Part - A**

(Answer should be given up to 25 words only)

**All questions are compulsory****(5×2=10)**

1. Describe the key elements of the Mechatronics system.
2. Consider an Electrical resistance strain gauge with a resistance of  $100\Omega$  and a gauge factor of 2.0. What is the change in resistance of the gauge when it is subjected to a strain of 0.001?
3. During a temperature measurement using bimetallic strips, an aluminium rod of 12 m length at  $28^\circ\text{C}$  expands. Calculate the expansion when the temperature changes from  $0^\circ\text{C}$  to  $120^\circ\text{C}$ ? Assume the thermal expansion coefficient for aluminium as  $25 \times 10^{-6}/^\circ\text{C}$ .
4. Explain with diagram the working of PVDF tactile sensor.
5. Compare physical components of hydraulic and pneumatic system along with advantages and disadvantages?

**Part - B**

(Analytical/Problem solving questions)

**Attempt any four questions****(4×10=40)**

1. Name and explain any two examples of sequential control systems.
2. Consider a parallel rectangular plate air - spaced capacitor of  $30 \times 20 \text{ cm}^2$  and the distance between the plates is 1.2 mm. If the relative permittivity for air is 1.006. Calculate the displacement sensitivity of the device by neglecting the displacement of the central plate. Assume permittivity of the plates as  $8.854 \times 10^{-12} \text{ F/m}$ .

3. Develop an op - amp circuit that can provide an output related to the input voltage by  $V_o = 5.5V_1 + 10V_2 + 4$ .
4. A negative feed back closed - loop system was subjected to 10 V and the system has a forward gain of 2 and feedback gain of 0.5. Determine (a) the output voltage (b) the error voltage. It is given that  $G(s) = 2$ ,  $H(s) = 0.5$  and  $R(s) = 10V$ .
5. Explain the principle of the brushless D.C. permanent magnet motor.
6. Describe in detail with diagrams, various pressure sensors and temperature sensors.

### Part - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **two** questions

(2×15=30)

1. Derive the relationship between the height  $h_1, h_2$  and time for the hydraulic system shown in Figure 1 given below. Neglect inertance.

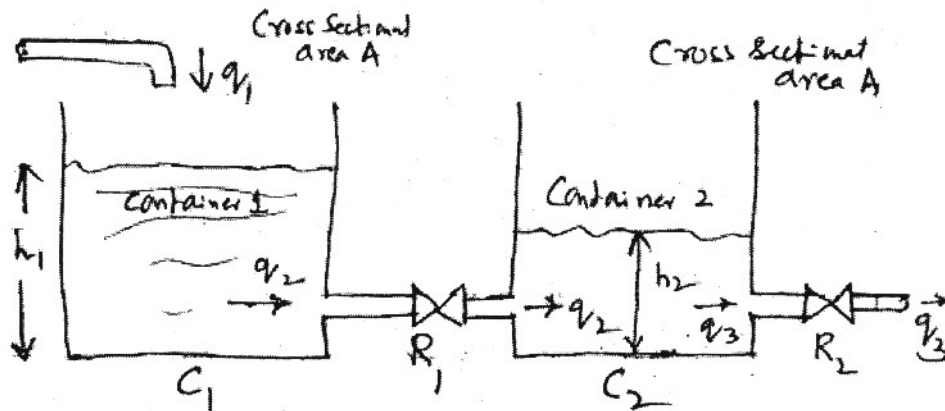


Figure 1

2. Explain the factors influence to design the Mechatronics system with one practical Example.
3. a) Explain for a microprocessor, the roles of (4)
  - i) Accumulator
  - ii) Status
  - iii) Memory address
  - iv) Program counter registers
- b) Draw a block diagram of a basic micro controller and explain the function of each subsystem. (6)
- c) What are various electrical Actuators Describe any four of them. (5)

B.Tech. V - Semester (Main) Examination, Nov. - 2019

PCC/PEC Mechanical Engg.

5ME4-02 : Heat Transfer

(Common For ME,AE)

Time : 3 Hours

Maximum Marks : 120

Min. Passing Marks : 42

**Instructions to Candidates:**

Attempt **all ten** questions from **Part A**, **five** question out of **Seven** from **Part B** and **Four** questions out of **Five** 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. Heat Transfer Data Book

**Part - A**

(Answer should be given up to **25** words only)

All questions are **compulsory**

(10×2=20)

1. What is heat transfer?
2. Convective heat transfer depends on which factors?
3. Explain Newton's law of cooling.
4. Write formula for radiation heat transfer between two surfaces.
5. Classify heat exchangers.
6. Write formula of LMTD for counter flow heat exchanger.
7. Construct the pool boiling curve.
8. What is drop wise condensation?
9. Construct the black body.
10. What is shape factor?

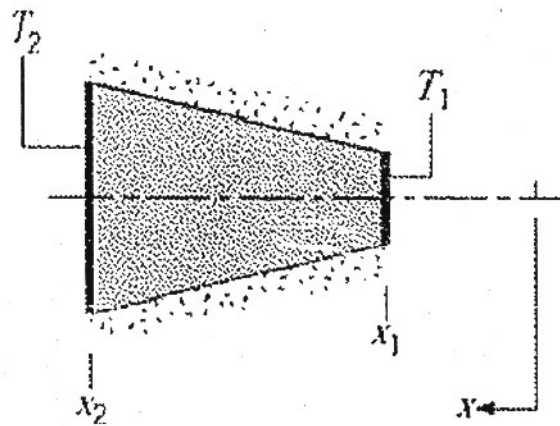
## Part - B

(Analytical/Problem solving questions)

Attempt any five questions

(5×8=40)

1. Explain the basic principle of the conduction, convection and radiation.
2. The diagram shows a conical section fabricated from Pyroceram ( $k = 3.46 \text{ W/m K}$ ). It is of circular cross section with the diameter  $D = ax$ , where  $a = 0.25$ . The small end is at  $x_1 = 50 \text{ mm}$  and the large end at  $x_2 = 250 \text{ mm}$ . The end temperature are  $T_1 = 400 \text{ K}$  and  $T_2 = 600 \text{ K}$ , while the lateral surface is well insulated.



- a) Derive an expression for the temperature distribution  $T(x)$  in symbolic form, assuming one - dimensional conditions. Sketch the temperature distribution.
  - b) Calculate the heat rate  $q_x$  through the cone.
3. Derive an expression and explain the critical radius of insulation for a long cylinder.
  4. A person sits in a room with surrounding air at  $26^\circ\text{C}$  and convection coefficient over the body surface is  $6 \text{ W/m}^2\text{K}$ . The walls in the room are at  $5^\circ\text{C}$  as the outside temperature is below freezing. If the body temperature is  $37^\circ\text{C}$ , determine the heat losses by convection and radiation. Assume  $F = 1.0$  for radiation. Consider a surface area of  $0.8\text{m}^2$ .
  5. Define Nusselt, Reynold's Prandtl and Stanton number. Explain their significance in forced convection.
  6. What is fin? Derive an expression of fin efficiency for an extended rectangular fin.
  7. State and explain Planck's distribution law of radiation.



## Part - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **Four** questions

(4×15=60)

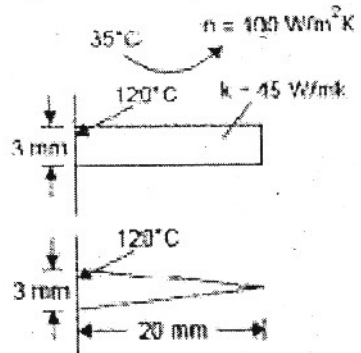
1. Derive an expression of conduction equation for the cylindrical coordinates.

2. Determine the heat flow for

(i) rectangular fins and

(ii) triangular fin of 20 mm length and 3 mm base thickness.

Thermal conductivity = 45 W/mK. Convection coefficient = 100 W/m<sup>2</sup>K, base temperature = 120°C surrounding fluid temperature = 35°C. Determine also the fin effectiveness (using the charts).



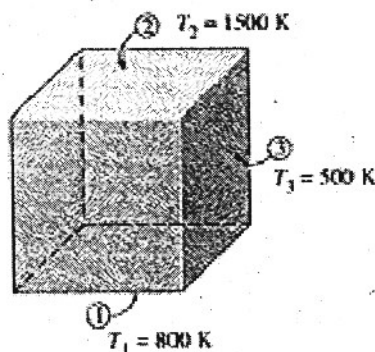
3. Derive an expression for effectiveness of counter flow heat exchanger and show its temperature distribution.

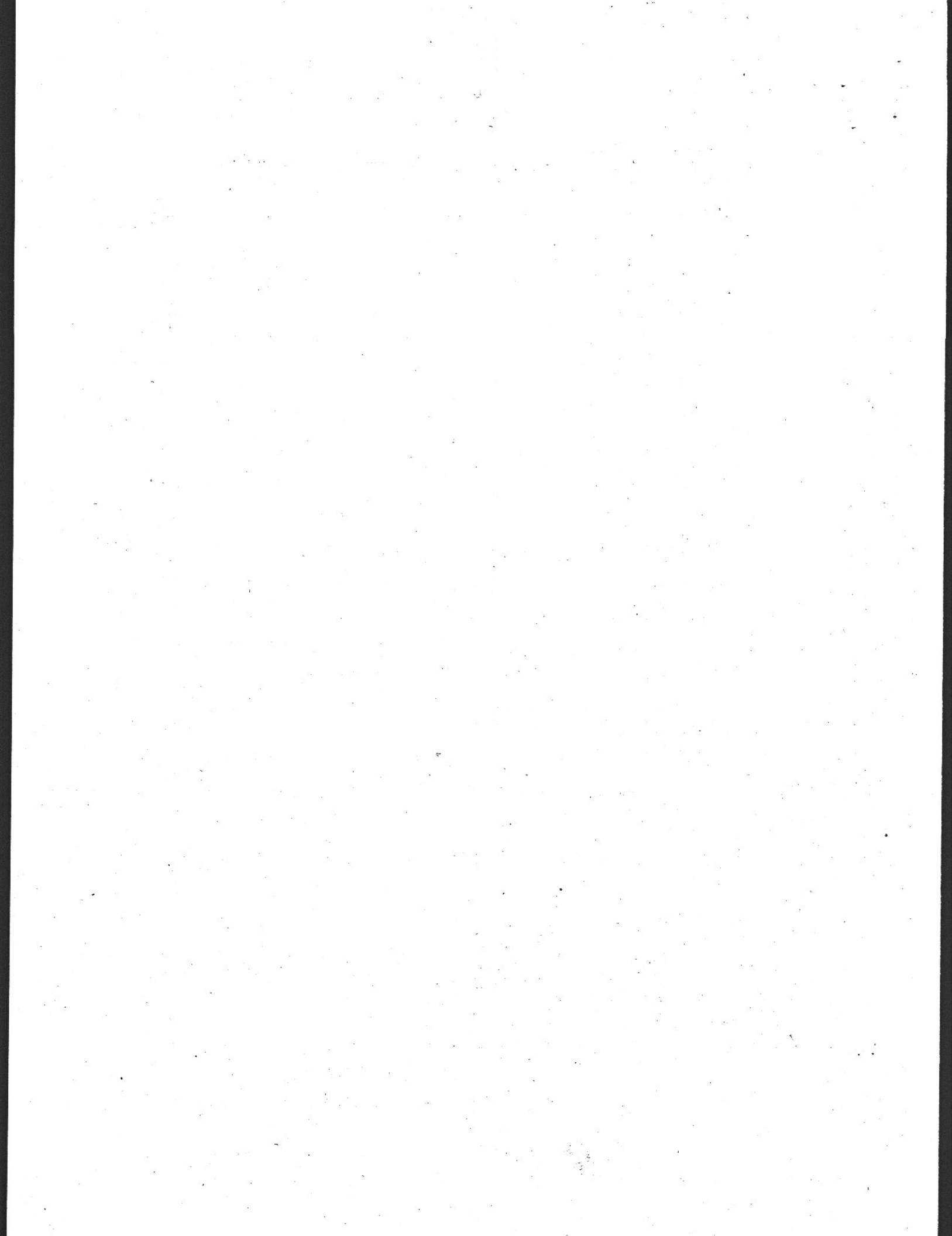
4. Explain the film wise and drop wise condensation with neat sketch.

5. Consider the 5 m × 5 m × 5 m cubical furnace (shown in Figure), whose surfaces closely approximate black surfaces. The base, top, and side surfaces are maintained at uniform temperatures of 800 K, 1500 K, and 500 K, respectively.

Determine :

- the net rate of radiation heat transfer between the base and the side surfaces,
- the net rate of radiation heat transfer between the base and the top surface, and
- the net radiation heat transfer from the base surface.





**B.Tech. V Semester (Main) Examination, Nov. - 2019**  
**PCC/PEC Mechanical Engg.**  
**5ME4-03: Manufacturing Technology**  
**Common For ME, AE**

**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 from Part B and Four questions out of Five 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.*

**PART - A**

Answer should be given up to **25** words only. All questions are **compulsory**.

**(10×2=20)**

1. How are the cutting tools classified?
2. What are the popular tool designation systems in common use?
3. What is built - up - edge (BUE)?
4. What are the conditions for using zero rake angle during metal cutting operation?
5. What is Machinability Index?
6. What are the main factors which influence the tool life?
7. Why lathe beds are made of cast iron?
8. Draw neat sketch of a twist drill.
9. Which materials are used in the manufacturing of grinding wheels?
10. Why trueing and dressing are necessary in grinding wheels?

**PART - B**

Analytical/Problem solving questions. Attempt any **Five** questions. **(5×8=40)**

1. Derive expressions for the cutting ratio. Also draw Merchant's Circle Diagram and show forces and angles acting on the cutting tool and different parameters involved in metal cutting.
2. What are the types of cutting tool wear patterns observed in single point cutting tools? How do they affect the metal cutting performance?

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.
4. What is the difference between a capstan and turret lathe? Explain with the help of suitable sketches.
5. Define the terms cutting speed and feed as applied to milling operations. How do you calculate the cutting speed of a milling cutter?
6. Compare grinding, honing and lapping operations.
7. What are the high velocity forming methods? Explain each method in detail.

### PART - C

Descriptive/Analytical/Problem Solving/Design questions. Attempt any Four questions. (4×15=60)

1. In an orthogonal cutting operation on a material with the shear yield strength of 250 N/mm<sup>2</sup> the following data is obtained Rake angle = 15°. Uncut chip thickness = 0.25 mm, Width of chip = 2 mm. Chip thickness ratio = 0.46, friction angle = 40° deg. Determine the shear angle, cutting force component and resultant force on the tool.
2. While machining steel with zero rake angle prove the following expression where 'r' is chip reduction coefficient.  $P_c$  is specific cutting power and  $\tau_s$  is shear strength of material.

$$\frac{\tau_s}{P_c} = \frac{r(1 - \mu r)}{1 + r^2}$$

3. 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.
4. What is the marking system followed in case of grinding wheels? Explain the individual elements of the marking system from the standpoint of the functioning of the wheel.
5. Describe step by step process of gear cutting by gear hobbing process with suitable figures.

**B.Tech. V Semester (Main) Examination, Nov. - 2019**  
**PCC/PEC Mechanical Engg.**  
**5ME4-04 Design of Machine Elements I**  
**Common For ME, AE**

**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 from Part B and Four questions out of Five 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.*

**Part - A**

(Answer should be given up to 25 words only)

**All questions are compulsory**

**(10×2=20)**

1. What are the economic aspects form the selection of material?
2. What is meant by Aesthetic consideration in design?
3. Define the term interchange ability and standardization.
4. Which theories of failure are applicable for shaft?
5. What are the methods of reducing stress concentration?
6. Define the terms lever and the displacement ratio.
7. What is the critical speed of shaft?
8. What is the purpose of rubber bush in pin type flexible coupling?
9. What is meant by bolts of uniform strength?
10. How will you designate the ISO metric coarse thread?

404

**Part - B**

(Analytical/Problem solving questions)

Attempt any five questions

(5×8=40)

1. Explain the various mechanical properties of engineering materials.
2. Explain the design considerations of casting process used in manufacturing?
3. Design the cotter against the failure under bending and express the bending stress induced.
4. The standard cross section for a flat key, which is fitted on a 50 mm diameter shaft, is 16×10mm. The key is transmitting 475 N-m torque from the shaft to the hub. The key is made of commercial steel ( $S_{yt} = S_{yc} = 230 \text{ N/mm}^2$ ). Determine the length of the key, if the FOS is 3.
5. A laminated leaf spring is to carry a load of 3400 N with a deflection of about 31 mm. The spring must be supported at ends, the distance between the supports being 650 mm and is loaded at the centre. Allow a maximum stress of 420 N/mm<sup>2</sup>. Take  $E = 2 \times 10^5$ . Find
  - a) The stress which will be induced if the load comes down with a shock, deflecting the spring 75 mm.
  - b) The magnitude of impact energy which the spring will absorb in this case.
6. The cylinder of a stationary engine is 0.12 m in diameter and is held to the crank case by M12×1.75 c, nickel steel bolts having core diameter 9.853 mm. the maximum gas pressure in the cylinder is 3.5 N/mm<sup>2</sup>. Assume the ultimate strength of this steel to be 800 N/mm<sup>2</sup> and the yield stress to be 600 N/mm<sup>2</sup>. Determine the number of bolts required. Take FOS = 2.
7. What is self - locking of the power screw? What is the condition for self locking?



205  
**Part - C**

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **Four** questions

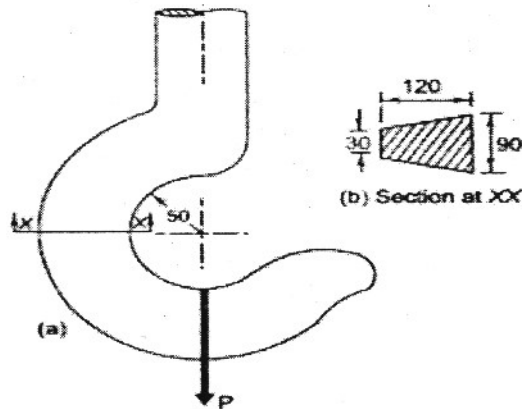
(4×15=60)

1. It is required to design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN. The rods are coaxial and a small amount of angular movement between their axes is permissible. On strength basis, the material of two rods and pin is selected as plain carbon steel of Grade 30C8 ( $S_{yt} = 400 \text{ N/mm}^2$ ), a higher FOS of 5 is assumed in present design. Design the joint and specify the dimensions of its component.
2. A right angled bell - crank lever is to designed to raise a load of 5 kN at the short arm end. The length of short and long arm is 100 and 450 mm respectively. The lever and pins are made of steel 30C8 ( $S_{yt} = 400 \text{ N/mm}^2$ ) and the FOS is 5. The permissible bearing pressure on the pin is  $10 \text{ N/mm}^2$ . The lever has rectangular cross - section and ratio of width to thickness is 1.25:1. Calculate
  - i) Diameter and length of fulcrum pin;
  - ii) Shear stress in the pin
  - iii) Dimensions of the boss of the lever at the fulcrum
  - iv) Dimension of the cross section of the lever

Assume that the arm of bending moment on the lever extend up to the axis of the fulcrum.

3. Explain the designing of shaft according to A.S.M.E. code.

4. A crane hook having an approximate trapezoidal cross section is shown in figure. It is made of plain carbon steel 45C8 ( $S_{yt} = 380 \text{ N/mm}^2$ ) and factor of safety is 3.5. Determine the load carrying capacity of the hook.



5. Write a short notes on

- i. Ergonomics
- ii. Allowable stress
- iii. Stiffness of spring
- iv. Beam Column



**5E1325****5E1325****B.Tech. V Semester (Main) Examination, November - 2019****PCC/PEC Mechanical Engg.****SME4-05 Principles of Management****Common for ME, AE****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 suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

**Part - A**

(Answer should be given up to **25** words only)

**All questions are compulsory**

**(5×2=10)**

1. Explain management with its significance in the current century.
2. Give the example of different levels of management in any organization.
3. Differentiate appraisal and rewards.
4. What is human factors? Give an example describing its relationship with motivation.
5. What is productivity? Describe its importance with respect to worker and organization.

**Part - B**

(Analytical/Problem solving questions)

**Attempt any four questions**

**(4×10=40)**

1. Describe the contributions of any two management thinkers :
  - a) Kautilya.
  - b) Taylor.
  - c) C.K. Prahlad.
  - d) Peter Drucker.
  - e) Henry fayol.

2. Calculate the number of relationship for two subordinates. Also draw the relationship diagram showing the relationship between superior manager subordinate.
3. Explain the role of manager in human resource management and selection.
4. Classify various motivational theories and explain the Maslow's hierarchy of needs with diagram.
5. Define controlling with its classification for a physical system.
6. Explain the process of communication followed in the organization.

### Part - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any two questions

(2×15=30)

1. Describe the management practice used by any two of the renowned persons with respect to the various functions of management :
  - a) Dhirubhai Ambani,
  - b) Ratan Tata,
  - c) Bill Gates,
  - d) Narayan Murthy
2. What is organization structure? Describe its effect with respect to any two companies.
3. What is leadership? How a leader will lead the organization, justify with suitable example of profile of any to leaders.



**B.Tech. V- Semester (Main) Examination, Nov. - 2019**  
**PCC/PEC Mechanical Engg.**  
**5ME5-12 Automobile Engineering**  
**(Common For ME, AE)**

**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 from Part B and Four questions out of Five 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.*

**PART - A**

(Answer should be given up to 25 words only)

**All questions are compulsory**

**(10×2=20)**

1. List the various loads that acts on a frame. (2)
2. What are the functions of a clutch? (2)
3. List out the functions of propeller shaft. (2)
4. What is meant by bleeding in braking system? (2)
5. What is over steering and under steering? (2)
6. Define camber angle and its effects on steering. (2)
7. What is meant by term tread and its function? (2)
8. What are the various loads on automobile air conditioning system? (2)
9. Name the safety divices used in automobile. (2)
10. Define cornering force. (2)

**PART - B**

(Analytical/Problem solving questions)

Attempt any **five** questions

(5×8=40)

1. Explain briefly the chassis construction with a suitable diagram. (4+4=8)
2. Explain in brief the operations of disc brake and drum brake system. Write its advantages and disadvantages. (3+3+2=8)
3. Explain the working of differential of an automobile with neat sketch. (4+4=8)
4. Discuss the working and salient features of Hotchkiss drive with a neat diagram. (5+3=8)
5. Explain the working of telescopic type of shock absorber with a neat sketch. (4+4=8)
6. Explain the working of Global positioning system in automobile in detail. (8)
7. Calculate the maximum power that a clutch can transmit without slipping based on constant pressure theory. (8)

**PART - C**

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **Four** questions

(4×15=60)

1. Name the types of gear boxes used in automobile. Describe the working and construction of a synchromesh gear box with a neat diagram. (2+4+4+5=15)
2. What is the difference between convention steering and power steering. Explain the working of power steering system with a neat sketch. (3+7+5=15)
3. Explain the construction and working of lead acid battery with a neat diagram. Write different methods of testing it (5+5+3+2=15)
4. Describe the working of the air conditioning system of an automobile with a neat diagram. Write in brief the possible faults and their remedies in air conditioning system. (7+5+3=15)
5. Explain the construction and working of torque convertor with a neat sketch. Write its advantages over conventional gear box. (4+5+4+2=15)



Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

**5E1328****5E1328**

**B.Tech. V Semester (Main) Examination, Nov. - 2019**  
**PCC/PEC Mechanical Engg.**  
**5ME5-13 Non Destructive Evaluation and Testing**  
**(Common For ME, AE)**

**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 from Part B and Four questions out of Five 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.*

**PART - A**

(Answer should be given up to **25** words only)

**All questions are compulsory**

**(10×2=20)**

1. Differentiate between destructive and non - destructive testing.
2. What are the major advantages of acoustic emission testing over other techniques?
3. What are the limitations of magnetic particle inspection?
4. What is the piezoelectric effect?
5. Explain Geometrical unsharpness.
6. Explain the basic principle of Thermography and its applications.
7. What is the most common method for demagnetising small test pieces? Explain in brief.
8. What is sensitivity in eddy current testing?
9. Describe Kaiser - felicity theory.
10. Draw neat sketch of X-ray generation in Radiography Testing.

**PART - B**

(Analytical/Problem solving questions)

Attempt any **five** questions

**(5×8=40)**

1. Explain near zone, far zone and transition zone in Ultrasonic Testing.

2. What is inductance and impedance plane in eddy current testing?
3. Specify any three ways to control the exposure when working with radiography sources.
4. Write short note on
  - a) Digital radiography
  - b) Neutron radiography
5. Differentiate among pulse echo, through transmission and angle beam technique.
6. What is the procedure of X Ray film processing? Explain in brief.
7. Briefly describe about Faraday's law and Lenz's law. Also explain about various types of probes used in eddy current testing.

### PART - C

(Descriptive/Analytical/Problem Solving/Design Questions)

Attempt any **Four** questions

(4×15=60)

1. Draw neat sketch of Normal, TR and Angle probes and standard test block used for ultrasonic testing.
2. What is the working principle of magnetic particle inspection? What type of light is used for fluorescent magnetic particle indications Briefly discuss the different magnetization techniques.
3. Explain the working principle of radiography with sketch. Differentiate between X-ray and Gamma ray radiography.
4. Define leak and leak rate. Explain in brief the leak testing of heat exchanger tubes in a boiler and underground oil pipe line.
5. Write the short note on :
  - a) Borescope
  - b) Endoscope
  - c) Flexiscope
  - d) Electron beam Holography.

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

**5E6201****5E6201****B.Tech. V - Semester (Back) Examination, Nov. - 2019****Mechanical Engg.****5ME1A Heat Transfer****(Common For ME, AE)****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****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. Heat Transfer Data Book.

**Unit - I**

1. Derive three dimensional time dependent heat conduction equation with internal heat generation and variable thermal conductivity in cartesian coordinate system. (16)

**(OR)**

1. Derive an expression for temperature distribution during steady state conduction in a solid sphere with internal heat generation and exposed to convection environment. (16)

**Unit - II**

2. a) A long rod 6.5 mm in diameter is exposed to an environment at 27°C. The base temperature of the rod is 150°C. The Heat transfer coefficient between the rod and environment is 30 W/m²K. Calculate the heat loss by the rod. (8)
- b) Steel balls 12 mm in diameter are annealed by heating to 1150 K and then slowly cooling to 400 K in air at 325 K with convection coefficient of 20 W/m²K. Assuming the properties of the steel to be  $K = 40 \text{ W/mK}$ ,  $\rho = 7800 \text{ kg/m}^3$ ,  $C = 600 \text{ J/KgK}$   
Estimate the time required for the cooling process. (8)

473

(OR)

2. a) Prove that the temperature distribution in a body at time  $t$  during a Newtonian heating or cooling is given by

$$\frac{T - T_{\infty}}{T_i - T_{\infty}} = e^{-Bi \times F_0} \quad (8)$$

- b) A 6 mm diameter mild steel rod ( $K = 54 \text{ W/mK}$ ,  $\rho = 7800 \text{ kg/m}^3$ ,  $C = 420 \text{ J/KgK}$ ) at  $38^\circ\text{C}$  is suddenly immersed in a liquid at  $100^\circ\text{C}$  with  $h = 110 \text{ W/m}^2\text{K}$ . Calculate the time required for the rod to get  $88^\circ\text{C}$ . (8)

**Unit - III**

3. Prove that the local heat transfer coefficient during filmwise condensation is

$$h_x = \left[ \frac{K_f^3 \rho^2 g h_{fg}}{4\mu x (T_{sat} - T_g)} \right]^{1/4} \quad (16)$$

(OR)

3. a) Estimate the coefficient of free convection on a wire, 2 mm in diameter, immersed in water at  $20^\circ\text{C}$ , if the wire surface is maintained at  $300^\circ\text{C}$ . (8)
- b) A hot plate  $1\text{m} \times 1\text{m}$  at  $180^\circ\text{C}$  is kept in still air at  $20^\circ\text{C}$ . Find the heat transfer coefficient of air.

Mass of plate is 40 kg and specific heat is  $400 \text{ J/KgK}$ . Assume that the 1m side is vertical. (8)

**Unit - IV**

4. a) In a counter flow double pipe heat exchanger, water is heated from  $40^\circ\text{C}$  to  $80^\circ\text{C}$  with an oil entering at  $105^\circ\text{C}$  and leaving at  $70^\circ\text{C}$ . Taking the overall heat transfer coefficient as  $300 \text{ W/m}^2\text{K}$  and the water flow rate as  $0.1 \text{ kg/s}$ . Calculate the heat exchanger area. (8)
- b) What are design and selection criteria of heat exchangers? (8)

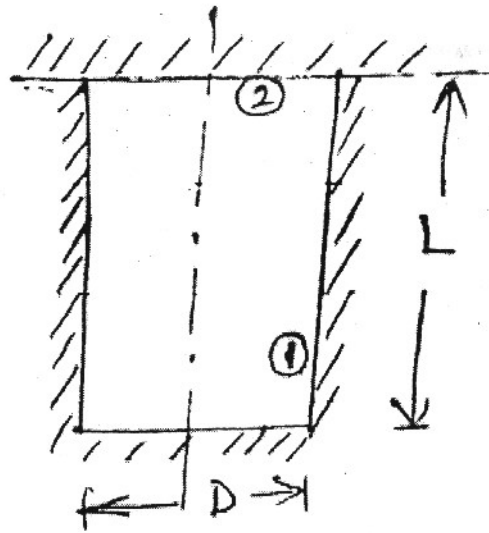
(OR)

4. Derive an expression for log mean temperature difference (LMTD) of parallel flow heat exchanger. (16)

**Unit - V**

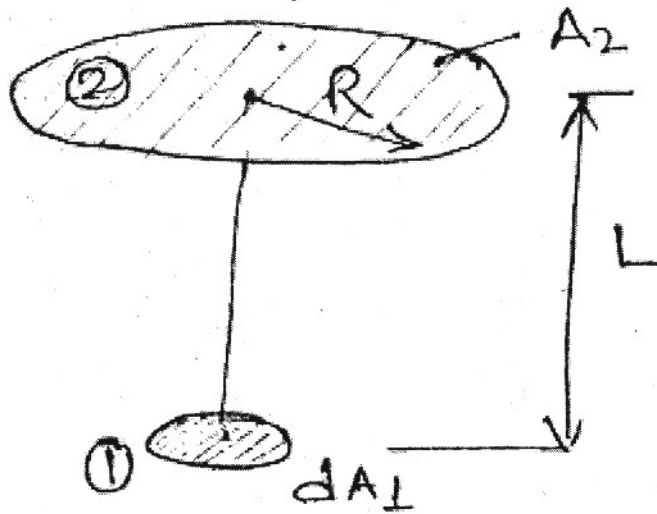
5. a) A 10 cm diameter spherical ball emits radiation at a rate of 30 W when its surface temperature is 400 K. Calculate the average emissivity of ball at this temperature. (8)

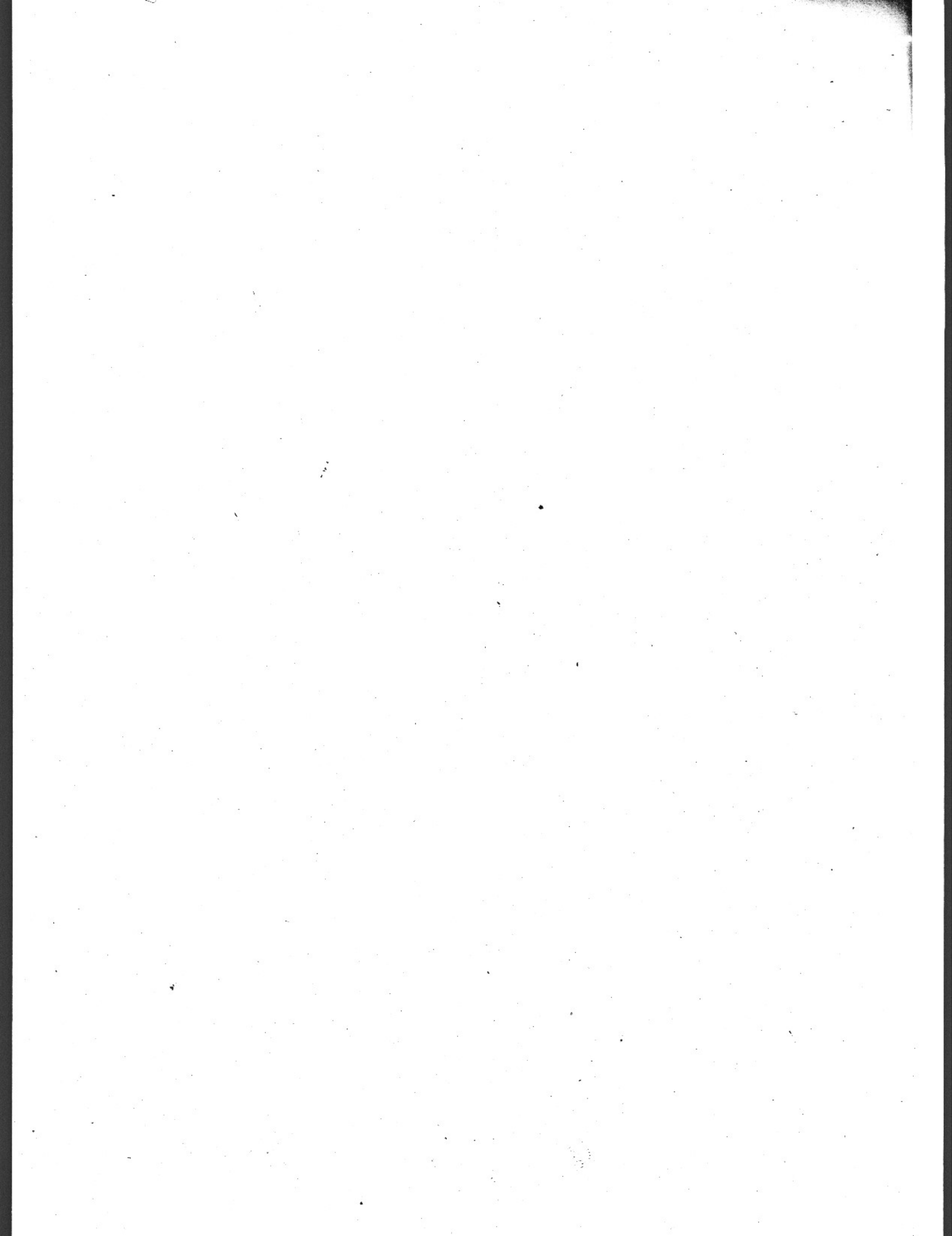
- b) Calculate the shape factor for cylindrical cavity as shown in figure with respect to itself. (8)



(OR)

5. Calculate the view factor  $F_{1-2}$  between a small area  $dA_1$  and a parallel circular disc  $A_2$ . The elemental area  $dA_1$  is located at the axis of the disc  $A_2$  at a distance L. (16)







5E6202

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

5E6202

B.Tech. V - Semester (Back) Examination, Nov. - 2019

Mechanical Engg.

5ME2A Dynamics of Machines

(Common for ME, AE)

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

**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.*

**UNIT - I**

1. What is the function of a governor? Explain the Porter and Hartnell governors with neat sketches. (16)

(OR)

1. a) Explain the terms and derive expressions for 'effort' and 'power' of a Porter governor with neat sketches. (10)
- b) How does governor differ from that of a flywheel? (6)

**UNIT - II**

2. Describe the gyroscopic effect on a sea going vessel during steering, pitching and rolling with neat sketches. (16)

(OR)

2. What do you mean by gyroscopic effect? Explain the effect of the gyroscopic couple on the reaction of the four wheels of a vehicle negotiating a curve with neat sketches. (16)

**UNIT - III**

3. Explain the terminologies of a gear. Also discuss the difference between cycloidal and involute profile of gears. (16)

4/6  
(OR)

3. Two mating involute spur gear of  $20^\circ$  pressure angle have a gear ratio of 2. The number of teeth on the pinion is 20 and its speed is 250 r.p.m. The module pitch of the teeth is 12 mm. If the addendum on each wheel is such that the path of approach and the path of recess on each side are half the maximum possible length, find: 1. the addendum for pinion and gear wheel; 2. the length of the arc of contact; and 3. the maximum velocity of sliding during approach and recess. Assume pinion to be the driver. (16)

#### UNIT -IV

4. a) Discuss various types of gear trains. (8)  
b) Explain the application of epicyclic gear train in differential gear of an automobile. (8)

(OR)

4. Write a short note on followings (any two): (2×8)  
i) Sliding mesh gear box  
ii) Constant mesh gear box  
iii) Synchromesh gear box

#### UNIT-V

5. a) Explain the balancing of different masses revolving in the same plane. (6)  
b) A shaft carries four masses A, B, C and D of magnitude 200 kg, 300 kg, 400 kg and 200 kg respectively and revolving at radii 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm and 700 mm. The angles between the cranks measured anticlockwise are A to B  $45^\circ$ , B to C  $70^\circ$  and C to D  $120^\circ$ . The balancing masses are to be placed in planes X and Y. The distance between the planes A and X is 100 mm, between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm, find their magnitudes and angular positions. (10)

(OR)

5. Derive the following expressions, for an uncoupled two cylinder locomotive engine:  
i) Variation in tractive force; (6)  
ii) Swaying couple; and (6)  
iii) Hammer blow. (4)

**5E6203**

Roll No. \_\_\_\_\_

[Total No. of Pages : 3]

**5E6203****B.Tech V - Semester (Back) Examination, Nov. - 2019****Mechanical Engg.****5ME3A Measurement And Metrology****(Common For ME, PI)****Time : 3 Hours****Maximum Marks : 80****Min. Passing Marks : 26****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.*

**UNIT - I**

- Q1. a)** State the basic requirement for getting the meaningful result of the measurement. [4]
- b) Explain clearly the difference between primary, secondary and working standards. [6]
- c) Differentiate between the terms "Accuracy" and "Precision". [6]

**(OR)**

- a) Explain various types of errors while measurement, and important ways to eliminate them. [8]
- b) A wattmeter having a range of 2000W has an error of  $\pm 1$  percent of full scale deflection, If the true value is 200W what would be the range of the reading? If the error is specified as percentage of the true value, what would be the range of the reading? [8]

**UNIT- II**

- Q2. a)** Compare advantages and limitations of commonly used precision instruments like: Vernier calipers (height and depth gauge), Micrometers (Internal and external) and dial indicator. [8]
- b) With the neat sketch explain the principle of a sine bar. [8]

(OR)

- a) What are desirable features of a comparator? [4]
- b) What are the essential requirements in the use of a sine bar to get accurate results. Why is sine bar not suitable for measuring angles above 45°? [6]
- c) Explain the principle on which the optical comparators are based. [6]

### UNIT - III

- Q3.** a) Give the procedure for measuring major diameter of a screw thread by using a bench micrometer. [8]
- (b) What are the various types of pitch errors on thread components and what is the difference between them? State the causes of each of them. How do these errors affect the effective diameter of screw thread? [8]

(OR)

- a) Explain each of the following terms showing its importance in the measurement of surface texture: [16]
- i) Lay
  - ii) Ra
  - iii) Sampling length
  - iv) Primary texture
  - v) Waviness
  - vi) Ten points height of irregularities
  - vii) Root Mean Square Value
  - viii) Centre Line Average value

### UNIT - IV

- Q4.** a) Explain with the help of a neat diagram construction and working of a flatness interferometer. [8]
- b) Describe briefly the alignment test conducted on pillar type drilling machine. [8]

(OR)

Explain Coordinate Measuring Machine with a neat sketch. Describe the various parts of a coordinate measuring machine. Also mention its advantages, disadvantages and limitations. [16]

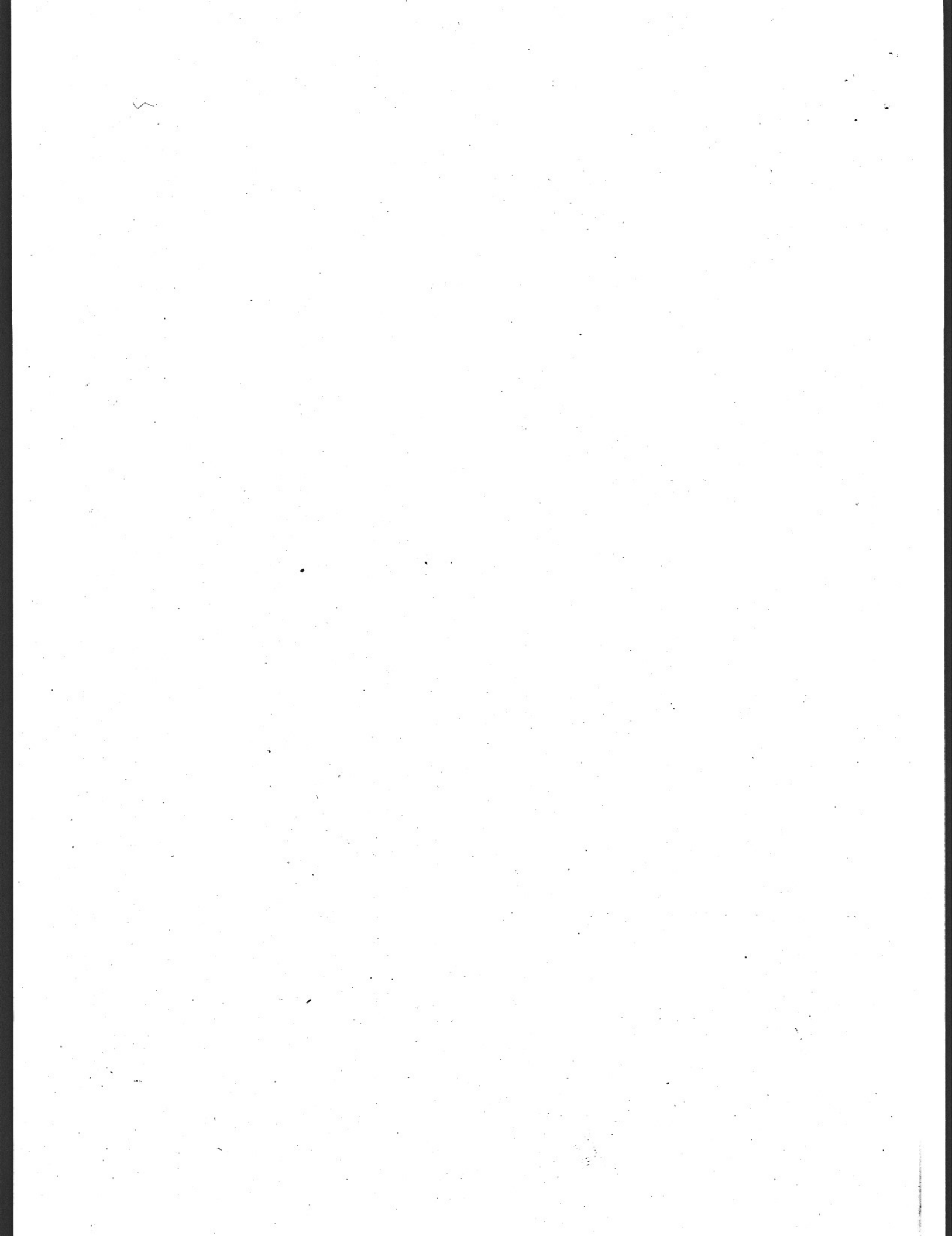
**UNIT - V**

- Q5. a)** Describe briefly the construction and working of strain gauge load cell. State its fields of application as well. [8]
- b)** Explain with neat sketch the construction and working of a pyrometer. [8]

**(OR)**

Explain briefly the following (Any **Two**) as applied to flow measurement: [16]

- i) Venturimeter
  - ii) Orifice meter
  - iii) Flow Nozzle
-





**B.Tech. V - Semester (Back) Examination, Nov. 2019**  
**Mechanical Engg.**  
**5ME4A Quality Assurance and Reliability**

**Time : 3 Hours**

**Maximum Marks : 80**

**Min. Passing Marks : 26**

**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.*

**UNIT - I**

1. a) What do you understand by "Quality of conformance" and "Quality of Design"? Explain with the help of one suitable example. (8)
- b) What do you understand by probability distribution? (8)

**(OR)**

1. Discuss the followings in detail: (4×4)
  - a) Dimensions of quality
  - b) History of quality
  - c) Quality improvements
  - d) Quality control

**UNIT-II**

2. a) Discuss the seven major SQC problem solving tools. (10)
- b) Explain Type-I and Type-II errors. (6)

**(OR)**

2. a) Define SQC and discuss the benefits of SQC. (8)
- b) Describe the method of constructing  $\bar{X}$  and R charts. (8)

421

### UNIT-III

3. a) Explain the concepts of process capability. When should it be estimated?  
Discuss its impact. (8)
- b) Distinguish between a non-conformity activity and a non-conformity item.  
Give example of each. (8)

(OR)

3. a) Compare: (4×2)
- i) p-chart with  $\bar{X}$  and R chart, and
- ii) Variable chart with Attribute chart.
- b) What are the advantages and disadvantages of control charts for attributes?(8)

### UNIT -IV

4. a) Discuss Quality Audit in detail. (8)
- b) Write short notes on: (4×2)
- i) ISO 9000
- ii) AOQL

(OR)

4. a) What are the sampling methods? Discuss in detail. (8)
- b) What is the importance of the OC curve in the selection of sampling plans?  
Describe the impact of the sample size and the acceptance number on the OC curve. (8)

### UNIT-V

5. a) Sketch "Bath Tub Curve" and discuss what information does it reveal. (8)
- b) Explain the use of reliability data and how calculation of failure rate is done?(8)

(OR)

5. Derive an expression of reliability on terms of failure rate and life of product, along with all assumptions. (16)

5E6205

Roll No. \_\_\_\_\_

[Total No. of Pages : 2]

5E6205

B.Tech. V- Semester (Back) Examination, November - 2019

Mechanical Engg.

5ME5A Sociology and Economics for Engineers

(Common for ME, PI, AE)

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

**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.*

**UNIT - I**

1. Explain fully the concept of social system. (16)

(OR)

1. Are we more civilized and progressive than our ancestors. Discuss. (16)

**UNIT - II**

2. Discuss the characteristics of an organization. (16)

(OR)

2. What are the characteristics of agrarian society. Discuss. (16)

**UNIT - III**

3. Explain the meaning and concept of demand. (16)

(OR)

3. Write short notes on national income. (16)

**UNIT - IV**

4. Discuss the role and functions of a central bank. (16)

(OR)

4. Briefly discuss the concept of inflation. (16)

423

**UNIT - V**

5. Do you think economic reforms are necessary for economic growth. Discuss. (16)

**(OR)**

5. Discuss the problems and remedies of unemployment in India. (16)
-

**B.Tech. V- Semester (Back) Examination, Nov. - 2019**  
**Mechanical Engg.**  
**5ME6.2A Automobile Engineering**

Time : 3 Hours

Maximum Marks : 80

Min. Passing Marks : 26

**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.*

**UNIT - I**

1. a) Draw and explain various types of chasis. Also mention their advantages and disadvantages.
- b) Draw and explain construction and working of fluid coupling. (16)

**(OR)**

1. a) Draw and explain the construction and working of single plate clutch. Compare any four features of single plate clutch over multiplate clutch.
- b) List various functions of brakes. Also list various features which are desirable from brakes. Draw line diagram of hydraulic brakes and explain its working. (16)

**UNIT - II**

2. a) Differentiate between sliding mesh and constant mesh gear box. Write advantages and disadvantages of All wheel drive.
- b) Draw and explain epicyclic gear box. How automatic transmission system works? Explain with suitable diagram. (16)

**(OR)**

2. a) How Hydraulic torque converter is different from fluid coupling? Draw and explain torque tube drive.
- b) Draw full transmission line, starting from engine shaft till tyres. Draw and explain the construction and working of differential. (16)

**UNIT - III**

3. a) Explain various types of tyres and their advantages and limitations. How Retreading of tyres is done, write all steps.
- b) Explain the objectives and requirements from a good suspension system. Draw and explain any shock absorber. (16)

**(OR)**

3. Write short notes on :

- a) Camber and Caster angle.
- b) Steering gear boxes.
- c) Power steering
- d) Tyre inflation pressure. (16)

**UNIT - IV**

4. a) List various types of battery used in automotive sector. Why batteries are still a big challenge in electric cars and bikes, answer with proper justification.
- b) Draw and explain the construction of starter motor and its working. (16)

**(OR)**

4. a) How magneto and coil ignition system works. (8)
- b) Draw and explain the working of Electric horn **OR** Fuel level indicator (Any One) (8)

**UNIT - V**

5. a) List various heat sources in an automobile compartment. If there is no proper cooling in automobile what are the possible causes and its remedies.
- b) Draw and explain the working of air bags. Comment on number of air bags varies from 2, 4, 6, 8 etc. available in automobiles. (16)

**(OR)**

5. Write short notes on :

- a) Seat belts
- b) Radio Ranging
- c) Global positioning
- d) Night vision system. (16)