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

252

Roll No. _____

# B.Tech. VI sem(Main/Back) Exam. June 2022
## HSMC Automobile Engg.
## 6AE3-01Measurement and Metrology
## 6E1601
## AE,ME

**Time: 2 Hours**            **Maximum Marks: 80**

**Min. Passing Marks: 28**

**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.

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

1_____            2. _____

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

Q.1. What is Measurement ? What are Fundamental Methods of measurement ?

Q.2 Define Sensitivity and repeatability ?

Q.3 What are the different methods of measuring angles ?

Q.4 What is comparators ? Write its types ?

Q.5 Define thermos electric effect?

$5 \times 2 = 10$

### Part B Analytical/Problem solving questions
### Attempt any four questions

Q.1 What is difference between Gauging & measurement?

Q.2 It is Proposed to measure the duameter of a large hole by a verniev caliper. What will be the disadvantages in doing so. Explain line standard and endstandard.

Q.3 Explain dial-test-indicator with neef sketch.

Q.4 Draw a sketch diagram for screw thread for its terminology. Define all thread elements.

Q.5 What is local Cell. Explain its working Principle.

Q.6 Define thermo couples. Explain thermo couple junction types.

$4 \times 10 = 40$

## Part C(Descriptive/Analytical/Problem Solving/Design Question)
## Attempt any two questions

Q.1    Define term interchangeability. Explain Limit, Fits & tolerances with neat sketch and definitions.

Q.2    What are roughness comparison specimens and how they assess surface rough ness? What are the limitations?

Q.3    (a) Explain co-ordinate measuring machines.
       (b) Explain Rotameter and its working principle.

**2 x 15 =30**

**6E1602**

**6E1602**

B.Tech. VI Sem. (Main/Back) Examination, June - 2022
Automobile Engg.
6AE5 - 12 CIMS

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.*

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

## PART - A

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

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

1. Mention the main elements of CIMS.

2. List the various activities involved in product development.

3. What is the most popular type of drive for CNC machines today?

4. Compare open loop and closed loop NC systems.

5. What is the use of PLC in NC Controller System?

6. What is canned cycle?

7. What is stick-slip motion and how they are reduced in a CNC?

8. What are the tasks performed by preparatory functions?

9. How is tool life monitored in FMS?

10. Why are CNC Machines not cost effective?

# PART - B

## (Analytical/Problem solving questions)

**Attempt any five questions.** (5×8=40)

1. What are the problems that are associated with conventional NC? How can it be overcome in CNC?

2. Describe the differences between mechanization and automation. Give specific examples of each.

3. What are the steps involved in the development of a Part Program? Explain with the help of a flow diagram.

4. Discuss how group technology is used in designing manufacturing cells.

5. Explain the need for computer aided process planning. What are its advantages.

6. Discuss how CIM can act as an enabling technology for concurrent engineering.

7. Write a manual part programming for drilling 24 holes of 6 mm diameter, equispaced, 6 mm deep on a rectangular plate of size 70 mm × 50 mm × 6mm. the X-Y spacing between the holes are 10 cm along X and Y such that there should be 6 holes to be drilled along axis for four rows.

# PART - C

## (Descriptive/Analytical/Problem Solving/Design Questions)

**Attempt any FOUR questions.** (4×15=60)

1. Under what conditions, an adaptive control is recommended? Discuss the ACC and ACO types of adaptive control with the help of suitable examples.

2. What are the differences between retrieval and generative type of computer-aided process planning? Which is better? Explain your answer. Also mention salient features of variant type of CAPP system.

3. Show schematically an FMS system (hardware) giving the various control linkages and networking requirement for information flow. Your answer should be complete in terms of the actual control components present and the type of information flow taking place in the system between various nodes.

**4.** Write an APT part program for the component shown in the figure.
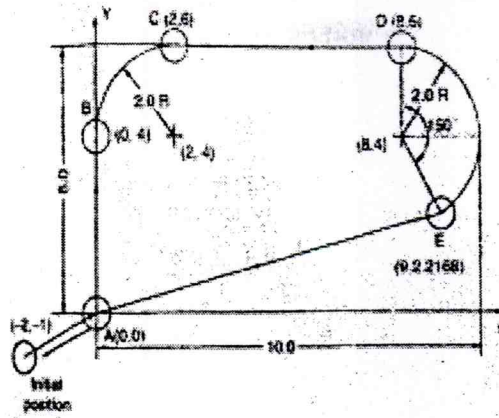
**6E1603**

**6E1603**

B.Tech. VI Sem. (Main/Black) Examination, June - 2022
Automobile Engg.
6AE4-03 Mechanical Vibrations

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

**Instructions to Candidates:**

*Attempt all 10 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.*

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

### PART - A

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

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

1. Write relation among sound power, sound intensity and sound pressure level.
2. Write the causes of vibrations.
3. Represent complex number -1-i in exponential form.
4. Write the physical significance of centre of percussion.
5. Write example (any two) of critically damped system.
6. What are the materials used in vibration isolation.
7. What do you mean by critical speed of shaft?
8. Write statement of maxwell's reciprocal theorem.
9. What do you mean by "transmissibility"?
10. Draw diagrams (any two) of system having two degree of freedom.

### PART - B

### (Analytical/Problem solving questions)

**Attempt any five questions.** (5×8=40)

1. Discuss about industrial noise control strategies.

2. Split up the harmonic motion $x = 10\sin(\omega t + \%)$ into two harmonic motions, one having a phase angle of zero and the other of $45^0$.

3. Derive the natural frequency of following system
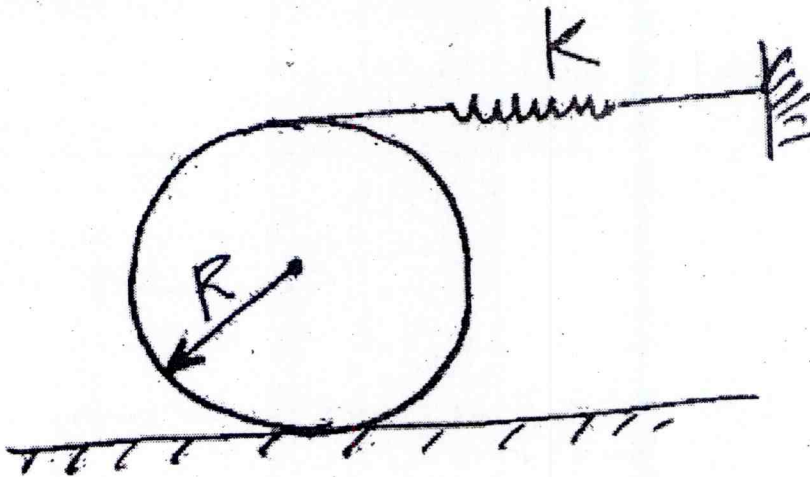


Mass of cylinder is taken as M. the motion of cylinder is pure rolling.

4. The amplitude of vibration of the system is observed to decrease to 25% of initial value after 5 consecutive cycles of motion calculate damping coefficient if $K = 3500$ N/M, $m = 4.5$ kg.

5. The damped natural frequency of a system as obtained from a free vibration test, is 9.8 Hz. During the forced vibration test with constant exciting force on the same system, the maximum amplitude of vibratin is found to be at 9.6 Hz. Find the dampling factor for the system and its natural frequency.

6. For a system given below.
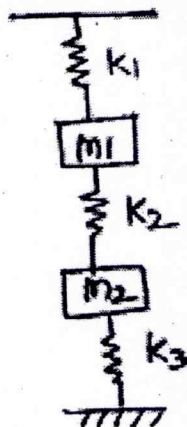


$m_1 = m_2 = m = 9.8$ kg
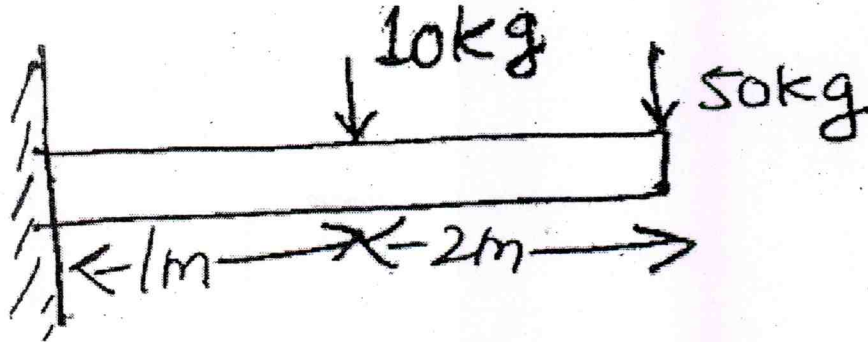
$K_1 = K_3 = 8820$ N/m

$K_2 = 3430$ N/h

Find out the resultant motion of $m_1$ and $m_2$ for following case

i) Both masses are desplaced 5mm in the downward direction and released simultaneously.

The displacements mentioned above are from the equilibrium positions of the respective masses.

7. Calculate the fundamental frequency of system given below using Dunkerley's method.



$E=1.96\times10^{11}N/m^2$

$I=4.10^{-7}m^4$

# PART - C
## (Descriptive/Analytical/Problem Solving/Design Questions)
**Attempt any FOUR questions.**                                      **(4×15=60)**

1. Discuss the following
   i) Auditory and Non auditory effects of noise
   ii) Classification of vibration.
2. Discuss transverse vibration of string.
3. Calculate frequencies and principal mode of vibration of following system.
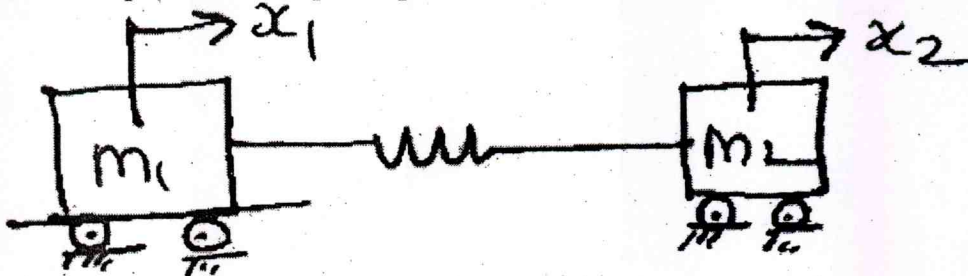


   $M_1 = 10$ kg, $m_2=15$kg, k=320 N/m.
4. Discuss about motion transmissibility in detail. Plot transmissibility v/s frequency ratio curve. Discuss about important points/ ranges.
5. Derive equation of motion for following system and determine the expression of C for which the system is critically damped. Neglect the weight of rod AB.
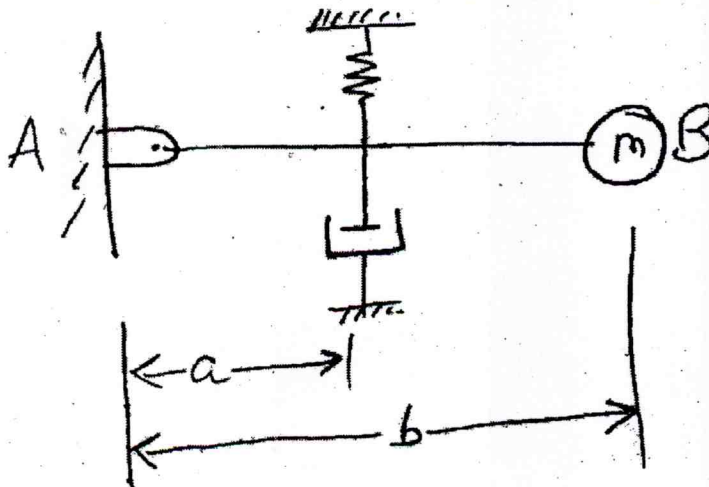
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**6E1604**

6E1604

## B.Tech. VI Sem. (Main/Back) Examination, June - 2022
## Mechanical Engg.
## 6ME4-04 Design of Machine Elements - II

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.*

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

### PART - A

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

1. Give two examples for

   i) Design by evolution

   ii) Design by innovation.

2. What are the common drawbacks of the maximum shear stress theory compared to maximum distortion energy theory?

3. Define cumulative fatigue damage.

4. Explain the two design criterion of shaft considering Torsion equation.

5. What is the difference between shaft and axle?

6. What are the affects of clearance on Performance of journal bearing?

7. Why are ball bearings preferred to journal bearings for shaft mounted on a gear box?

8. What do you mean by blow-by operation in case of IC engine?

9. How is the wear of the piston rings prevented?

10. What is role of Lewis equation in case of gear design?

## PART - B

**Attempt any five questions** (5×8=40)

1. A machine member is made of plain carbon steel of ultimate strength 520 N/mm² and endurance limit 200N/mm² . If it is subjected to 413 N/mm² for 3000 cycles determine relaxed fatigue limit.

2. A twelve shaft transmit 500 kw at 900 rpm. The allowable shear stress is 80 N/mm² while twist is limited to 0.5. in length of 2.5 m. Calculate diameter of shaft.

3. Explain the significance of section modulus.

4. A shaft rotating at 1440 rpm is supported by two bearings the forces acting of each bearing are 6000N radial load and 3500 N axial thrust If the shaft diameter is 40 mm and expected life is 500 h for Bearing, select suitable bearing.

5. Why does a filling-notch bearing support a higher radial load than a deep groove ball bearing?

6. Which type of cross section is preferred for the main body of connecting rod and why?

7. What are the factors which decide the selection of a drive for power transmission. Explain in context of flat belt, V-belt, chain and rope drive.

## PART - C

**Attempt any FOUR questions** (4×15=60)

1. A 30 kw, 1000 rpm motor transmits power to a stone crushing machine which operates at 250 r.p.m. Select suitable belt.

2. A pair of bevel gears required to transmit 10 kw power at 500 rpm from a motor shaft to a machine shaft. The speed reduction is 3:1. The shafts are Inclined at 60. the pinion is mounted midway on the shaft which is supported between two bearings having span if 200mm. Design the gear pair.

3. Design a journal bearing for a 10 mw, 1000 r.p.m. steam twelve which is supported by two bearings consider average industrial bearing.

4. Design a cylinder for a 4- stroke water cooled diesel engine developing 4 kw at 1500 r.p.m. Assume that the indicated mean effective pressure at full Load condition is $700 \text{ kN/m}^2$.

5. Explain the force analysis of spur and helical Scans.

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6E1605

6E1605

B.Tech. VI Sem. (Main/Back) Examination, June - 2022
Automobile Engg.
6 AE5- 13  Quality Management

**Time : 3 Hours**

**Maximum Marks : 120**
**Min. Passing Marks : 42**

*Instructions to Candidates*

*Attempt all 10 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.*

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

i)    Areas under the normal curve

ii)   Factors for estimating $\sigma'$ from $\bar{R}$ or $\bar{\sigma}$

iii)  Factors for determining from $\bar{R}$ the $3\sigma$ control limits for $\bar{X}$ and R Charts

iv)   Factors for determining from $\bar{\sigma}$ the $3\sigma$ control limits for $\bar{X}$, R and $\sigma$ Charts

v)    Factors for determining from $\sigma'$ the $3\sigma$ control limits for $\bar{X}$, R and $\sigma$ Charts

vi)   $3\sigma$ control limits for control charts for per cent defective.

vii)  Summation of terms of poisson's Exponential Binomial Limits.

## PART - A

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

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

1.   What is *quality of conformance?*

2.   Define the term *quality control*.

3.   Differentiate between *variable and attribute* data with suitable examples.

4.   Define the term *dispersion*. Name its various measures.

5.   State the objectives of statistical quality control.

6. What is meant by process capability?

7. Write the purpose of using p-chart.

8. Give the salient features of an operating characteristic (OC) curve.

9. Define MTBF.

10. What is a *robust design* as proposed by Taguchi?

## PART - B

### (Analytical/Problem solving questions)

**Attempt any five questions**                                    (5×8=40)

1. A machine shop produces steel pins. The width of 100 pins was checked after machining data and recorded as follows:

| Width in mm | Frequency | Width in mm | Frequency |
|---|---|---|---|
| 9.50-9.51 | 6 | 9.58-9.59 | 22 |
| 9.52-9.53 | 2 | 9.60-9.61 | 8 |
| 9.54-9.55 | 20 | 9.62-9.63 | 6 |
| 9.56-9.57 | 32 | 9.64-9.65 | 4 |

a) Find the arithmetic mean, Standard deviation and variance.

b) What percentage of the pins manufactured has width of 9.52 to 9.63.

2. The following table shows the averages and ranges of the spindle diameters in millimeters for 30 subgroups of 5 items each.

| $\overline{X}$ | R | $\overline{X}$ | R | $\overline{X}$ | R |
|---|---|---|---|---|---|
| 45.020 | 0.375 | 45.600 | 0.275 | 45.260 | 0.150 |
| 44.950 | 0.450 | 45.020 | 0.175 | 45.650 | 0.200 |
| 45.480 | 0.450 | 45.320 | 0.200 | 45.620 | 0.400 |
| 45.320 | 0.150 | 45.560 | 0.425 | 45.480 | 0.225 |
| 45.280 | 0.200 | 45.140 | 0.250 | 45.380 | 0.125 |
| 45.820 | 0.250 | 45.620 | 0.375 | 45.660 | 0.350 |
| 45.580 | 0.275 | 45.800 | 0.475 | 45.460 | 0.225 |
| 45.400 | 0.475 | 45.500 | 0.200 | 45.640 | 0.375 |
| 45.660 | 0.475 | 45.780 | 0.275 | 45.390 | 0.650 |
| 45.680 | 0.275 | 45.640 | 0.225 | 45.290 | 0.350 |

For the first 20 samples set up a $\bar{X}$ chart and an R chart. Plot the next 10 samples on these charts to see if the process continues 'under control' both as to average and range. Also find the process capability.

3. An electronics company manufactures several types of cathode ray tubes on a mass production basis. During the past month, tube Type A has caused considerable difficulty. The following table contains data from 21 days of this trouble-some period. Compute the central line and 3-sigma control limits for a p-chart for this tube process. 100 units are inspected per day.

| Day | Tube type A fraction rejected | Day | Tub type A fraction rejected |
|-----|-------------------------------|-----|------------------------------|
| 1 | 0.22 | 12 | 0.46 |
| 2 | 0.33 | 13 | 0.31 |
| 3 | 0.24 | 14 | 0.24 |
| 4 | 0.20 | 15 | 0.22 |
| 5 | 0.18 | 16 | 0.22 |
| 6 | 0.24 | 17 | 0.29 |
| 7 | 0.24 | 18 | 0.31 |
| 8 | 0.29 | 19 | 0.21 |
| 9 | 0.18 | 20 | 0.26 |
| 10 | 0.27 | 21 | 0.24 |
| 11 | 0.31 | | |

4. A single sampling plan is given as N= 10,000, n = 100 and c=2.
   i) Compute the approximate probability of acceptance of lots with 1% defective.
   ii) Determine the AOQ value for the above lots.
   iii) What will be the average inspection in percent? (Assume acceptance, rectification plan).

5. The following table gives the numbers of missing rivets noted at aircraft final inspection:

| Air plane Number | Number of missing rivets | Air plane Number | Number of missing rivets | Air plane Number | Number of missing rivets |
|------------------|--------------------------|------------------|--------------------------|------------------|--------------------------|
| 1 | 8 | 10 | 12 | 19 | 11 |
| 2 | 16 | 11 | 23 | 20 | 9 |
| 3 | 14 | 12 | 16 | 21 | 10 |
| 4 | 19 | 13 | 9 | 22 | 22 |
| 5 | 11 | 14 | 25 | 23 | 7 |
| 6 | 15 | 15 | 15 | 24 | 28 |
| 7 | 8 | 16 | 9 | 25 | 9 |
| 8 | 11 | 17 | 9 | | |
| 9 | 21 | 18 | 14 | | |

Find $\bar{C}$, compute trial control limits, and plot chart for C. What values of $C'$ would you suggest for the subsequent period.

6. Explain the step-by-step procedure for constructing an OC curve for a single sampling plan by taking n=300 and c=5.

7. Define reliability. An equipment is subjected to a maintenance time constraints of 30 minutes. What is the probability that it will meet the specification if MTTR is 0.262 hours?

## PART - C

### (Descriptive/Analytical/Problem Solving/Design Questions)

**Attempt any FOUR questions** (4×15=60)

1. Explain the term quality assurance. Mention in detail the activities accomplished under quality assurance function in an organization.

2. Describe in detail the use of process capability data in manufacturing planning using a suitable example.

3. Describe the various steps necessary for obtaining ISO: 9000 standard registration.

4. What is the difference between a *defect* and *defective*? Outline the theory underlying control charts for defects.

5. Write technical notes on:

    i) Producer's risk

    ii) Consumer's risk

    iii) Acceptable quality level

    iv) Lot-tolerance-percent-defective

    v) Indifferent quality level.

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**6E1606**

**6E1606**

B.Tech. VI Sem. (Main/Back) Examination, June - 2022
Automobile Engineering
6AE5-11 Refrigeration and Air Conditioning

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.*

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

## PART - A

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

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

1.  What is the use of Flash Chamber in a vapour compression cycle?

2.  What is compounding in vapour compression cycle?

3.  Draw T-s and P-v diagram for the reversed Carnot cycle.

4.  Describe the expansion device used in gas cycle.

5.  Write the chemical formula of refrigerants R113 and R744.

6.  What is thermo-electric cooling?

7.  Differentiate between Dry Bulb and Wet Bulb temperature.

8.  Which kind of cooling load is considered when a human body considered in cooled space?

9.  How much relative humidity is expected to be maintained during air-conditioning in winter?

10. What will be the effect on the effective temperature with increase in the relative humidity at the same dry bulb temperature?

## PART - B

### (Analytical/Problem solving questions)

**Attempt any five questions** $(5 \times 8 = 40)$

11. Saturated ammonia vapour enters a 15 cm dia × 14 cm stroke twin cylinder single acting compressor at 0.2365 MPa whose volumetric efficiency is 79% and speed 420 rpm. The delivery pressure is 1.1672 MPa. The liquid ammonia at 21°C enters the expansion valve. For ideal cycle find:

   a) The rate of circulation of ammonia

   b) The refrigeration in ton

   c) COP of the cycle

   Take specific heat and density of ammonia as 2.19 kJ/kg.k and 0.77 kg/m3.

12. Why air is used as refrigerants in a reversed Brayton cycle? Draw T-s and P-v diagram for the cycle and derive the expression for COP in term of pressure ratio.

13. Describe the working of an Electrolux refrigerator.

14. A vapour absorption refrigerate system comes with generator, ambient and evaporator temperature as 360K, 310K and 260K respectively. Find the maximum COP? If the evaporator temperature falls to 250K, what should be the generator temperature in order to operate the system with same COP?

15. Define the term "Effective Temperature" and explains its importance in air conditioning system. Describe the factors which affect effective temperature.

16. Moist air at 1.013 bar and 30°C contains 10 gram of water vapour per kg of dry air. Assuming that air and water vapour mixtures behave as an ideal gas and the saturation pressure of vapour at 30°C is 3.167kPa. Find the relative humidity of air.

17. Explain the winter air conditioning system with a neat sketch. Why a single Psychrometric process cannot be applied in winter air conditioning?

## PART - C

### (Descriptive/Analytical/Problem Solving/Design Questions)

**Attempt any FOUR questions** $(4 \times 15 = 60)$

18. Explain the working of a refrigeration system having three evaporators at different temperatures with individual compressors and individual expansion valves with the help of schematic and P-h diagram. Also derive its coefficient of performance.

19. An air craft moving with speed of 1000 km/hour uses simple gas refrigeration cycle for air conditioning. The ambient pressure and temperature are 0.35 bar and -10⁰ C respectively. The pressure ratio of compressor is 4.5. The heat exchanger effectiveness is 0.95. The isentropic efficiencies of compressor and expander are 0.8 each. The cabin pressure and temperature are 1.06 bar and 25⁰C. Determine temperatures and pressures at all points of the cycle. Also find the volume flow rate through compressor inlet and expander outlet for 100TR. Take $Cp=1.005$ kJ/kg-K. $R = 0.287$ kJ/kg K and $Cp/Cv=1.4$ for air.

20. Describe the working of practical Aqua-Ammonia vapour absorption refrigeration system with neat sketch.

21. Atmospheric air at 0.965 bar enters the adiabatic saturator. The wet bulb temperature is 20⁰ C and dry bulb temperature is 31⁰C during adiabatic saturation process. Determine:

    i)    Humidity ratio of entering air.

    ii)   Vapour pressure and relative humidity at 31⁰ C and

    iii)  Dew point temperature.

22. A hall is to be maintained at 24⁰ C DBT and 60% RH. When the following data are given: Outdoor conditions = 38⁰ C DBT and 28⁰ WBT; Sensible heat load in the room=160000 kJ/hr.; Latent heat load in the room = 40,000 kJ/hr.; Total unfiltered air = 1200 m³/hr; Apparatus dew point temperature=10° C.

    The quantity of air recirculated air from the hall is 60% of total. If the recirculated air is mixed with the conditioned air after the cooling coil, then find the following;

    i)    The condition of air leaving the conditioner coil and before mixing with re-circulated air.

    ii)   Condition of air before entering the hall.

    iii)  The mass of air entering the cooler

    iv)   The mass of total air passing through the hall.

    v)    By pass factor of the cooling coil.

Roll No. _____     [Total No. of Pages : 2

**6E1607**

6E1607

B.Tech. VI Sem. (Main/Back) Examination, June - 2022
Mechanical Engineering
6ME5 - 12 NON Conventional Machining Methods

Time : 3 Hours

Maximum Marks : 120
Min. Passing Marks : 42

**Instructions to Candidates:**

*Attempt all 10 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.*

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

## Part - A
### (Answer should be given up to 25 words only)
**All questions are compulsory**                                   (10×2=20)

1. Describe the need of non-conventional machining methods.
2. Write applications of non-conventional machining methods in health care sector.
3. Classify different advance machining process.
4. What type of machining process is suitable for plain and cylindrical surfaces? Brief the process in short.
5. Write advantage and applications of AJM
6. Demonstrate the working principle of EDM.
7. Write main process parameters for EDG.
8. Describe the precision finishing process.
9. Differentiate ECM and chemical machining.
10. Write application of micro and nano machining in aircraft industries.

## PART - B
### (Analytical/Problem solving questions)
**Attempt any five questions**                                   (5×8=40)

1. Differentiate traditional, non-conventional and micro & nono machining.
2. What is hybrid machining? How it is executed on traditional machines? Explain.
3. What is water jet cutting? How it is done? Explain in brief.
4. Write advantages, disadvantages and applications of AJM.

6E1607/2022                        (1)                        [Contd....

5. Write advantages, disadvantages and application of ECM.
6. Explain ECG process with schematic diagram.
7. Describe these topics:
   a) Anode shape prediction
   b) ESD

# PART - C
## (Descriptive/Analytical/Problem Solving/Design Questions)
**Attempt any FOUR questions** (4×15=60)

1. What is non-conventional machining? How it is different from the traditional machining processes? Classify the various non-conventional machining processes according to the application.

2. Explain the working principle and process of any one mechanical advanced machining process:
   a) AJM
   b) USM

3. Write the principle, working and process parameters used in any one thermo electric advanced machining process:
   a) EDM
   b) EDG

4. Explain the working principle and process of any one mechanical advanced machining process
   a) EBM
   b) LBM.

5. Classify the different electrochemical machining process. Explain the principle and working of tool design for ECM process.

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**6E7011**

**6E7011**

## B.Tech. VI Sem. (Back) Examination, June - 2022
### Automobile Engineering
### 6AE1A Design of Machine Elements - II

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).*

## UNIT - I

1. a) Define stress concentration. Describe the methods of reduction of stress concentration with suitable sketch. **(10)**

   b) Explain modified goodman diagram for bending stresses. **(6)**

### (OR)

1. a) What is Notch sensitivity factor? Explain physical significance of Notch sensitivity factor being one and zero. **(6)**

   b) A 25 mm diameter shaft is made of forged steel 30 C8 ($S_{ut} = 600 \, N/mm^2$). there is a step in the shaft and the theoritical stress concentration factor at the step is 2.1 the Notch sensitivity factor is 0.84. Determine the endurance limit of shaft if. it is subjected to reversed bending moment. **(10)**

## UNIT - II

2. a) Write design considerations for a piston. **(4)**

   b) Determine the dimensional of I section connecting rod for a petrol engine from the following data :

   Diameter of piston = 110 mm ; mass of reciprocating parts = 2 kg, Length of connecting rod from centre to centre = 325 mm; stroke length = 150 mm; RPM = 1500 with possible overspeed of 2500 ; CR = 4:1; Maximum explosion pressure = 2.5N/mm². **(12)**

### (OR)

2. a) Design a plain carbon steel centre crankshaft for a single acting four stroke, single cylinder engine for following data : **(12)**

Piston diameter = 250 mm; stroke = 400 mm;

Maximum combustion pressure = 2.5 N/mm²; weight of flywheel = 16kN; Total belt pull = 3 N; length of connecting rod = 950 mm.

When the crank has turned through 30° from TDC, the pressure on the piston is 1 N/mm² and torque on crank is maximum.

b) Explain the various stresses induced in the connecting rod. **(4)**

## UNIT - III

3. a) Explain the following terms of the spring. **(6×2)**

   i. Free length.

   ii. Solid height.

   iii. Spring rate.

   iv. Active and inactive coils.

   v. Spring index.

   vi. Stress factor.

   b) What is nipping in a leaf spring? Discuss its role. **(4)**

### (OR)

3. A semi - elliptical spring has ten leaves in all, with the two full length leaves extending 625 mm it is 62.5 mm wide and 6.25 mm thick. Design a helical spring with mean diameter of coil 100 mm which will have approximately the same induced stress and deflection for onlyload. the young's modulas for the material of the semi - elliptical spring may be taken as 200 kN/mm² and modulas of rigidity for the material of helical spring is 80 kN/mm². **(16)**

## UNIT - IV

4. a) What is gears? Which type of gears are used when the shafts are perpendicular to each other? Write applications of gear drives. **(6)**

   b) In a pair of spur gears, the number of teeth on the pinion and gear are 20 and 100 respectively the module is 6 mm. Calculate. **(10)**

   i. Centre distance.

   ii. Pitch circle diameters.

   iii. Addendum and dedendum.

   iv. Tooth thickness.

   v. Gear Ratio.

### (OR)

**4.** **a)** What is level gear? Derive the expressions for three components of resultant tooth force in bevel gears. **(8)**

**b)** What is worm gears? Write advantages and drawbacks of worm gear drives. Why heat dissipation is important consideration in worm gear drive.**(2+3+3)**

## UNIT - V

**5.** **a)** What are journal bearings? What are the various terms used in journal bearing analysis and design? Define them. **(8)**

**b)** Explain the working of different types of thurst bearing with suitable sketch.**(8)**

**(OR)**

**5.** **a)** A ball bearing operates on following work cycle :

| Element No. | Radial Load (N) | Speed (RPM) | Element time (%) |
|---|---|---|---|
| 1 | 3000 | 720 | 30 |
| 2 | 7000 | 1440 | 40 |
| 3 | 5000 | 900 | 30 |

Dynamic load capacity of the bearing is 16600 N. Calculate

1. Average speed of rotation.
2. Equivalent radial load.
3. Bearing life. **(12)**

**b)** What do you mean by bearing life? Explain. **(4)**

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6E7013

B.Tech. VI-Sem (Back) Exam. 2022
Mechanical Engineering
6ME3A Mechatronics
ME,PI
6E7013

Time: 3Hours                                    Maximum Marks: 80
                                               Min Passing Marks:  26

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. _____                              2. _____

## UNIT -I

Q.1 (a) Write the scope and application of mechatronics system.
Q.1 (b) What do you mean by flexible manufacturing system (FMS)? Write merits and demerits of FMS.

8+8

OR

Q.1 (a) Describe the nanotechnology in details.
Q.1 (b) Describe the basic structure of micro-controllers.

8+8

## UNIT -II

Q.2 (a) What is the significance of sensor used in machines and equipments? Write and explain the classification of sensors.
Q.2 (b) Define actuation system and differentiate hydraulic with pneumatic actuation system.

8+8

OR

Q.2 (a) Describe the piezoelectric actuators in detail.
Q.2 (b) Explain the working of temperature sensors with suitable diagrams.

8+8

## UNIT -III

Q.3 (a) What do you understand by signal? Write the advantages of digital over analog system

Q.3 (b) Explain the application of digital signal processing as mechatronics controller.

8+8

OR

Q.3 (a) Explain control system design. Differentiate adaptive and non-linear control design.

Q.3 (b) How can you define design optimization of mechatronics system?

8+8

## UNIT -IV

Q.4 (a) Describe analog to digital conversion with suitable diagrams.

Q.4 (b) Explain objectives and application of data acquisition system.

8+8

OR

Q.4 (a) What do you mean by signal conditioning system? Explain the types of signal conditioning system.

Q.4 (b) What is data acquisition system? Explain single channel data acquisition system with a neat block diagram.

8+8

## UNIT -V

Q.5 (a) What is (ABS) Anti-Lock Braking System? Explain its operation in detail.

Q.5 (b) Explain Computer Numerical Control (CNC) machines.

8+8

OR

Q.5 (a) Discuss the design and working of an aeroplane.

Q.5 (b) What are the technologies used in robot and manipulator arms?

8+8