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| Hall Ticket Number : |  |  |  |  |  |  |  |  |  |
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| <b>R-15</b> |
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**Code: 5G564**

III B.Tech. II Semester Supplementary Examinations July/August 2021

**Applied Thermodynamics-III**  
( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|--------------|
| <b>UNIT-I</b>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 1.              | a) Describe with neat sketch, the working of a simple constant pressure gas turbine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10M   | CO1 | L2           |
|                 | b) State the difference in working of an open and closed cycle gas turbine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 4M    | CO1 | L2           |
| <b>OR</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 2.              | Explain the working of a turbo jet propulsion system with the help of schematic arrangement of its different components and the T-s diagram of its basic cycle.                                                                                                                                                                                                                                                                                                                                                                                                                                 | 14M   | CO1 | L2           |
| <b>UNIT-II</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 3.              | Describe the working of the simple air cooling cycle with the help of schematic and T-s diagrams.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 14M   | CO1 | L2           |
| <b>OR</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 4.              | Explain the functions of various components of a vapour compression refrigeration system and represent the cycle on T- s and p-h diagrams.                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 14M   | CO1 | L2           |
| <b>UNIT-III</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 5.              | a) Describe with neat sketch the Li-Br and water system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 8M    | CO2 | L2           |
|                 | b) Discuss the desirable properties of a good refrigerant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 6M    | CO2 | L2           |
| <b>OR</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 6.              | a) Draw the schematic diagram of actual vapour absorption refrigeration system and explain its performance.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 10M   | CO2 | L2           |
|                 | b) Differentiate between primary and secondary refrigerants.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4M    | CO2 | L2           |
| <b>UNIT-IV</b>  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 7.              | It is required to design an air-conditioning plant for a small office room for following winter conditions :<br>Outdoor conditions : 14°C DBT and 10°C WBT<br>Required conditions : 20°C DBT and 60% R.H.<br>Amount of air circulation : 0.30 m <sup>3</sup> /min./person.<br>Seating capacity of office : 60.<br>The required condition is achieved first by heating and then by adiabatic humidifying. Determine the following :<br>(i) Heating capacity of the coil in kW and the surface temperature required if the by pass factor of coil is 0.4.<br>(ii) The capacity of the humidifier. | 14M   | CO3 | L3           |
| <b>OR</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 8.              | 1 kg of air at 313 K dry bulb temperature and 50 % RH is mixed with 2 kg of air at 293 K dry bulb temperature and 293 k dew point temperature. Find the final condition of air.                                                                                                                                                                                                                                                                                                                                                                                                                 | 14M   | CO3 | L3           |
| <b>UNIT-V</b>   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 9.              | a) Describe the different types of heating and cooling devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 7M    | CO4 | L2           |
|                 | b) Describe an air-water heat pump circuit and its applications.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 7M    | CO4 | L2           |
| <b>OR</b>       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |       |     |              |
| 10.             | a) Illustrate the operation of any one type of dehumidifier used during different seasons of the year.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 7M    | CO4 | L2           |
|                 | b) Write a short note on air-washer type humidifier with diagram.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 7M    | CO4 | L2           |

\*\*\*END\*\*\*

Code: 5G562

III B.Tech. II Semester Supplementary Examinations July/Aug 2021

**CAD/CAM**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Outline the working of a Raster scan graphics coordinate system 7M
- b) Emphasize the need for concatenation of transformations? 7M

**OR**

2. a) Differentiate between product cycle in conventional and computerized manufacturing systems with the help of neat diagrams. 8M
- b) Illustrate various display devices used in CAD/CAM applications? 6M

**UNIT-II**

3. a) Define a geometric model? Describe how a 3-D object is represented by a wire frame model. 7M
- b) Distinguish between 2-D and 3-D wireframe models. 7M

**OR**

4. a) Summarize various curve representation methods used for geometric modeling. 7M
- b) State the classification of various surfaces that can be used in geometric modeling applications and explain b-spline surfaces 7M

**UNIT-III**

5. a) Generalize the advantages of using CNC as compared to NC. 7M
- b) Interpret various Numerical Control elements with neat block diagram? 7M

**OR**

6. Write an APT program to cut the profile shown in figure1. Make suitable assumptions.

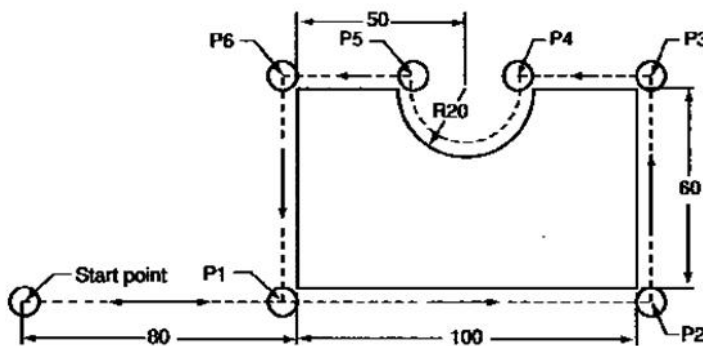


Figure 1

14M

**UNIT-IV**

7. a) Define FMS? Discuss various components of FMS in detail. 7M
- b) Enumerate the applications of FMS. 7M

**OR**

8. a) Briefly summarize the Optiz coding system generally used in group technology? 7M
- b) List out the benefits of Group Technology (GT) and explain the role of GT in industry. 7M

**UNIT-V**

9. a) Describe the importance of quality control in CIM and emphasize the outcome of quality control methods. 7M
- b) Illustrate the differences between conventional Quality Control and computer aided quality control. 7M

**OR**

10. a) Describe at least one type of non-contact inspection methods 7M
- b) Contrast in detail between MRP-I and MRP-II in context to computer integrated production planning. 7M

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Code: 5G565

III B.Tech. II Semester Supplementary Examinations July/August 2021

**Design of Machine Elements-II**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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| Marks | CO | Blooms Level |
|-------|----|--------------|
|-------|----|--------------|

**UNIT-I**

- |                                                                                                                                                                                                                                                                                                                               |     |     |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 1. a) What are the advantages and disadvantages of hydrostatic bearings over hydrodynamic bearings.                                                                                                                                                                                                                           | 4M  | CO1 | L1 |
| b) The following data is given for a 360° hydrodynamic bearing: Journal diameter =100 mm, bearing length =100 mm, radial load = 50 kN, journal speed = 1440rpm, radial clearance =0.12 mm, viscosity of lubricant =16 Cp. Determine (i) Minimum film thickness (ii) Coefficient of friction and (iii) Power lost in friction. | 10M | CO1 | L5 |

**OR**

- |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 2. Estimate the design of a Journal bearing for a centrifugal pump from the following data : Load on the journal = 20000 N, speed of the journal=900rpm, type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg/m-s, ambient temperature of oil = 15.5°C, Maximum bearing pressure for the pump=1.5 N/mm². Calculate also the mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m²/°C. | 14M | CO1 | L6 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|

**UNIT-II**

- |                                                                                                                                                                                                                                                                                                                                                                 |     |     |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 3. a) Explain briefly about Static and Dynamic load rating of rolling contact bearings.                                                                                                                                                                                                                                                                         | 4M  | CO2 | L2 |
| b) A system involves four identical ball bearings, each subjected to a radial load of 2500 N. The reliability of the system i.e., one out of four bearings failing during the lifetime of five million revolutions, is 82 %. Determine the dynamic load carrying of the bearing, so as to select it from the manufacturer's catalogue based on 90% reliability. | 10M | CO2 | L5 |

**OR**

- |                                                                                                                                                                                                                               |     |     |    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 4. a) What are rolling contact bearings? Discuss their advantages over sliding contact bearings.                                                                                                                              | 4M  | CO2 | L1 |
| b) Select a single row deep groove ball bearing for a radial load of 4000 N and an axial load of 5000 N, operating at a speed of 1600 rpm for an average life of 5 years at 10 hours per day. Assume uniform and steady load. | 10M | CO2 | L5 |

**UNIT-III**

- |                                                                                                                                                                                                                                                                                   |     |     |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 5. Estimate the design of a Connecting rod for a petrol engine from the following data : Diameter of the piston = 120 mm, Weight of the reciprocating parts=2.0kg, Length of the connecting rod=300 mm, stroke length=140mm, speed=2000rpm, Maximum explosion pressure=2.25N/mm². | 14M | CO3 | L6 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|

**OR**

- |                                                                   |     |     |    |
|-------------------------------------------------------------------|-----|-----|----|
| 6. Describe the design procedure for the Piston of an I.C.Engine. | 14M | CO3 | L2 |
|-------------------------------------------------------------------|-----|-----|----|

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| UNIT-IV |
|---------|

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|----|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 7. | a) | Explain the construction of Multileaf Springs.                                                                                                                                                                                                                                                             | 4M  | CO4 | L2 |
|    | b) | A railway wagon of mass 20 tonnes is moving with a velocity of 2 m/s. It is brought to rest by two buffers with springs of 300 mm diameter. The maximum deflection of springs is 250 mm. The allowable shear stress in the spring material is 600 MPa. Estimate the design of the springs for the buffers. | 10M | CO4 | L6 |

OR

- |    |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |     |    |
|----|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 8. | a) | What are the advantages of Flat belt drives?                                                                                                                                                                                                                                                                                                                                                                                                                                            | 4M  | CO4 | L1 |
|    | b) | A flat belt is required to transmit 30 kW from a pulley of 1.5 m effective diameter running at 300 rpm. The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required. It is given that the belt thickness is 9.5 mm, density of its material is $1100 \text{ kg/m}^3$ and the related permissible working stress is 2.5 MPa. | 10M | CO4 | L5 |

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| UNIT-V |
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- |    |    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |     |    |
|----|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|----|
| 9. | a) | What are the applications and advantages of Spur gears?                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 4M  | CO5 | L1 |
|    | b) | The pitch circle diameters of the pinion and gear are 100 mm and 300 mm respectively. The pinion is made of plain carbon steel 40C8 ( $S_u = 600 \text{ N/mm}^2$ ) while the gear is made of grey Cast Iron FG 300 ( $S_{ut} = 300 \text{ N/mm}^2$ ). The pinion receives 5 kW power at 500 rpm through its shaft. The service factor and the factor of safety can be taken as 1.5 each. The face width of the gear can be taken as 10 times that of the module. Assume that the velocity factor accounts for the dynamic load. Determine (i) module and (ii) the number of teeth on the pinion and the gear. | 10M | CO5 | L5 |

OR

- |     |    |                                                                 |    |     |    |
|-----|----|-----------------------------------------------------------------|----|-----|----|
| 10. | a) | What are the advantages of Helical gears?                       | 7M | CO5 | L1 |
|     | b) | Briefly discuss about the gear tooth failure and their remedies | 7M | CO5 | L5 |

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| <b>R-15</b> |
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**Code: 5G566**

III B.Tech. II Semester Supplementary Examinations July/Aug 2021

## **Industrial Management**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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### **UNIT-I**

1. Define Management and explain in detail, the evolution of management thought. 14M

**OR**

2. Discuss in detail, the basic concepts related to an organization. 14M

### **UNIT-II**

3. Explain the factors of selecting a plant location with specific reference to rural and urban sites. 14M

**OR**

4. Compare and contrast CPM and PERT and explain their importance in project management. 14M

### **UNIT-III**

5. Explain in detail, the concept, steps involved and the tools used for Method Study. 14M

**OR**

6. Define Work Sampling and explain in detail, the steps involved in work sampling. 14M

### **UNIT-IV**

7. Explain in detail, the objectives and functions of Inventory Management. 14M

**OR**

8. Define and explain in detail, the concept of TQM. 14M

### **UNIT-V**

9. Define Job Evaluation and explain in detail the different types of evaluation methods. 14M

**OR**

10. Explain in detail, with the help of an example, the concept of Product Life Cycle. 14M

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Hall Ticket Number :

R-15

Code: 5G561

III B.Tech. II Semester Supplementary Examinations July/Aug 2021

**Instrumentation and Control Systems**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer any five full questions by choosing one question from each unit ( 5x14 = 70 Marks )

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|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|--------------|
| <b>UNIT-I</b>                                                                    |                                                                                                                                                    |       |     |              |
| 1.                                                                               | a) Explain the basic principles of measurement.                                                                                                    | 7M    | CO1 | BL2          |
|                                                                                  | b) Explain the use of piezo electric transducers for displacement measurement.                                                                     | 7M    | CO2 | BL2          |
| <b>OR</b>                                                                        |                                                                                                                                                    |       |     |              |
| 2.                                                                               | a) Explain the following terms: i) Range and span ii) Resolution iii) Calibration iv) Sensitivity.                                                 | 8M    | CO1 | BL2          |
|                                                                                  | b) Explain the working principle of variable-inductance transducer with a neat sketch and also list out its advantages.                            | 6M    | CO2 | BL2          |
| <b>UNIT-II</b>                                                                   |                                                                                                                                                    |       |     |              |
| 3.                                                                               | a) Describe the arrangement of thermocouples for the measurement of average temperature of a room.                                                 | 8M    | CO3 | BL1          |
|                                                                                  | b) Describe the radiation pyrometer with a neat sketch                                                                                             | 6M    | CO3 | BL1          |
| <b>OR</b>                                                                        |                                                                                                                                                    |       |     |              |
| 4.                                                                               | a) Explain the working of magnetic flow meter with neat sketch.                                                                                    | 7M    | CO3 | BL2          |
|                                                                                  | b) Explain with the help of suitable sketches, the difference between a Bellow gauge and a diaphragm gauge for pressure measurement.               | 7M    | CO3 | BL2          |
| <b>UNIT-III</b>                                                                  |                                                                                                                                                    |       |     |              |
| 5.                                                                               | a) Explain the mechanical methods to measure the vibrations with neat sketches.                                                                    | 7M    | CO4 | BL2          |
|                                                                                  | b) How does a mechanical load cell work? Explain the principle of measuring shaft torque using strain gauge torsion meter?                         | 7M    | CO4 | BL1          |
| <b>OR</b>                                                                        |                                                                                                                                                    |       |     |              |
| 6.                                                                               | a) Discuss in detail the working of various types of dynamometers used for force measurement.                                                      | 7M    | CO4 | BL6          |
|                                                                                  | b) Explain the measurement of vibration by the reed vibrometer.                                                                                    | 7M    | CO4 | BL2          |
| <b>UNIT-IV</b>                                                                   |                                                                                                                                                    |       |     |              |
| 7.                                                                               | a) What is the temperature compensation with respect to strain gauges?                                                                             | 7M    | CO5 | BL1          |
|                                                                                  | b) List the essential characteristics required for the backing material of a bonded strain gauge.                                                  | 7M    | CO5 | BL1          |
| <b>OR</b>                                                                        |                                                                                                                                                    |       |     |              |
| 8.                                                                               | a) Explain how strain gauges can be used for the measurement of bending stresses?                                                                  | 7M    | CO5 | BL2          |
|                                                                                  | b) Name the various types of strain gauges for different applications?                                                                             | 7M    | CO5 | BL1          |
| <b>UNIT-V</b>                                                                    |                                                                                                                                                    |       |     |              |
| 9.                                                                               | a) What is a servomechanism? Describe the feature of servomechanism.                                                                               | 8M    | CO6 | BL1          |
|                                                                                  | b) List the advantages of open loop control system.                                                                                                | 6M    | CO6 | BL1          |
| <b>OR</b>                                                                        |                                                                                                                                                    |       |     |              |
| 10.                                                                              | a) What is a block diagram? Explain the steps involved in the preparation of block diagrams.                                                       | 6M    | CO6 | BL1          |
|                                                                                  | b) Derive an expression for the peak overshoot of a second order under damped system with the following transfer function, subjected to unit step. | 8M    | CO6 | BL6          |
| $G(s) = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$ *****<br>***END*** |                                                                                                                                                    |       |     |              |

Hall Ticket Number :

**R-15**

**Code: 5G563**

III B.Tech. II Semester Supplementary Examinations July/Aug 2021

**Metrology and Surface Engineering**

( Mechanical Engineering )

Max. Marks: 70

Time: 3 Hours

Answer all five units by choosing one question from each unit ( 5 x 14 = 70 Marks )

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**UNIT-I**

1. a) Explain Taylor's Principle of Gauge Design with suitable example? 14M

**OR**

2. a) Find the shaft and hole dimensions with tolerance for a 90H8e9 pair given the following data:

90 mm lies in the diameter step of 80 to 100mm

Upper deviation for e shaft =  $-11 D^{0.41}$

(IT8 = 25i ; IT9= 40i)

14M

**UNIT-II**

3. Describe the working principle of NPL Flatness interferometer with a sketch. 14M

4. The angle of wedge shaped block is being checked with 100mm Sine bar With slip gauges of 26.867mm height at one end of Sine bar, the dial gauge readings at each end of the work piece vary by 0.06mm, the gauge block end being low. If the work piece is 30mm long what should be the next height of the gauge block tried? Also calculate the angle of the work piece? 14M

**UNIT-III**

5. What is a comparator? Explain the working principle in mechanical –optical comparator 14M

6. In the measurements of surface roughness the heights of 10 successive peaks and valleys over a datum line over a specified sampling length were found to be in micrometer Peaks: 45, 42, 40, 35, 35 Valleys: 30, 25, 25, 24, 18  
Find CLA and RMS? 14M

**UNIT-IV**

7. a) What is best wire size for effective diameter measurement 7M  
b) Explain about the pitch errors in screw thread 7M

8. Discuss constant Chord method for Gear tooth thickness measurement. 14M

**UNIT-V**

9. Name the different alignment tests to be performed on a drilling machine. 14M

10. a) Explain various mechanical cleaning processes 7M  
b) Explain briefly about diffusion coatings 7M

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