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<b>R-14</b>
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**Code: 4G564**

III B.Tech. II Semester Supplementary Examinations May 2018

**Applied Thermodynamics-III**  
( 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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Note: Refrigeration & Air-Conditioning tables are allowed  
Symbols and abbreviations are having their regular meaning.

**UNIT-I**

1. Describe briefly with the help of neat sketches and T-s diagrams, various methods employed for improvement of thermal efficiency of an open cycle gas turbine plant. 14M

**OR**

2. A turbojet engine flying at a speed of 925 km/h consumes air at the rate of 60 kg/s. Calculate: (i) Exit velocity of jet when the enthalpy change for the nozzle is 210 kJ/kg and velocity co-efficient is 0.96, (ii) Fuel flow rate in kg/s when air-fuel ratio is 72:1, (iii) Thrust specific fuel consumption, (iv) Thermal Efficiency of the plant when the combustion efficiency is 91% and calorific value of fuel is 44500 kJ/kg, (v) Propulsive power and (vi) Propulsive efficiency. 14M

**UNIT-II**

3. a) Briefly explain the working of an air-refrigeration system with neat sketch. Represent the cycle on *P-h* and T-s charts. 7M

b) An ice plant produces 12 tonnes of ice per day at 0°C using water at room temperature of 30°C. Calculate the power rating of the compressor-motor if the COP of the plant is 3. Consider overall electro-mechanical efficiency of compressor-motor is 0.9.

Consider latent of heat of freezing for water is 335 kJ/kg.

Specific heat of water is 4.184 kJ/kgK 7M

**OR**

4. A vapour compression refrigerator circulates 5.2 kg of NH<sub>3</sub> per minute. Condensation takes place at 32°C and evaporation at -12°C. There is no sub-cooling of the refrigerant. The temperature after isentropic compression is 80°C and specific heat of superheated vapour is 2.76 kJ/kgK. Calculate:  
i. Co-efficient of Performance of the refrigerator,  
ii. Ice produced in kg per hour in the evaporator form water at 32°C to ice at 0°C. Consider latent heat of fusion of ice = 336 kJ/kg, specific heat of water = 4.187 kJ/kgK, and  
iii. The effective swept volume of the compressor in m<sup>3</sup>/min. 14M

**UNIT-III**

5. Describe the working of a NH<sub>3</sub>-H<sub>2</sub>O vapour absorption refrigeration system with a neat sketch. 14M

**OR**

6. In an absorption refrigeration system, the generator, condenser and evaporator temperatures are 112°C, 40°C and -10°C respectively. Calculate the ideal COP of the system. Calculate the change in COP in the following cases occurring independently. (i) Generator temperature increases by 20°C, (ii) Condenser temperatures decreases by 10°C and (iii) Evaporator temperature rises by 8°C. 14M

**UNIT-IV**

7. 120 m<sup>3</sup> of air per minute at 40°C and 65% relative humidity is cooled to 20°C DBT by passing through a cooling coil. Calculate:  
(i) Capacity of cooling coil in kJ/h  
(ii) Amount of water vapour removed per hour,  
(iii) Relative humidity of air at its exit and  
(iv) WBT of air at its exit. 14M

**OR**

8. a) Describe the working of a winter air-conditioning system with a neat sketch. 7M  
b) Explain the following process with the help of psychrometric chart  
(i) Sensible heating,  
(ii) Heating and Dehumidification and  
(iii) Cooling and Humidification. 7M

**UNIT-V**

9. What are the different air filters used in air-conditioning systems? Explain the advantages and disadvantages of viscous filters over dry filters. 14M

**OR**

10. Explain different methods of humidifying the air. Give their relative merits and demerits. 14M

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Code: 4G562

III B.Tech. II Semester Supplementary Examinations May 2018

**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) Define the term Product Life cycle. Also compare and contrast between the product life cycle in a conventional manufacturing environment and in a computerized manufacturing environment. 10M
- b) State the benefits of Computer Aided Design. 4M

**OR**

2. a) What is display unit? Explain screen buffer and scanning related to CAD systems. 7M
- b) Explain the concept of various coordinate systems required for geometric display systems. Give an example. 7M

**UNIT-II**

3. a) What are the various types of curve fitting manipulation techniques? Explain them. 7M
- b) State the differences between C-rep and B-rep techniques of solid modeling. 7M

**OR**

4. A cubic Bezier curve is defined by the control points as (1, 3), (4, 5), (5, 7) and (8, 4). Find the equation of the curve and calculate the point at  $u=0.4$  and  $u=0.6$ . 14M

**UNIT-III**

5. a) Discuss the different NC words used in part programming techniques. 7M
- b) Explain the basic feedback control system used in CNC machine tools. 7M

**OR**

6. a) With a block diagram explain main features of CNC machine tools. 7M
- b) Differentiate between manual part programming and computer aided part programming in CNC machines. 7M

**UNIT-IV**

7. a) What is the basis for forming groups in group technology? Explain the concept of composite part. 7M
- b) What are the differences between retrieval and generative type of computer aided process planning? Which is better? Explain your choice. 7M

**OR**

8. a) Explain the benefits of well designed classification and coding system for GT. 7M
- b) What is production flow analysis? Discuss various steps involved in it. 7M

**UNIT-V**

9. a) Write the working principle of computer vision system as applied to quality control. 7M
- b) Explain the application of machine vision in computer aided inspection. 7M

**OR**

10. a) What are the types of CMM? State the applications. 7M
- b) Distinguish between automation and CIM. 7M

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Hall Ticket Number :

R-14

Code: 4G565

III B.Tech. II Semester Supplementary Examinations May 2018

**Design of Machine Elements-II**

( 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. Design a journal bearing for a centrifugal pump with the following data. Diameter of journal=140mm, load on the bearing=50kN and speed of the journal = 800rpm. 14M

**OR**

2. Design a journal bearing to support a load of 5000N at 720rpm using a hard hardened steel journal and a bronze backed babbit bearing. The bearing is lubricated by oil rings, room temperature is 25° and oil temperature is 82°. 14M

**UNIT-II**

3. a) Select a bearing for a 40mm diameter shaft rotates at 400rpm. Due to bevel gear mounted on the shaft, the bearing will have to withstand a 5000N radial and a 3000N thrust load. The life of the bearing expected to be at least 1000hrs. 8M

- b) Define the static and dynamic load carrying capacities of roller bearing. Write the expressions for the same. 6M

**OR**

4. A single-row deep groove ball bearing is used to support the lay shaft of a four speed automobile gear box. It is subjected to the following loads in respective speed ratios:

Gear	Axial Load(N)	Radial load(N)	%time engaged
First gear	3250	4000	1%
Second gear	500	2750	3%
Third gear	50	2750	21%
Fourth gear	Nil	Nil	75%

The lay shaft is fixed to the engine shaft and rotates at 1750 rpm. The static and dynamic load carrying capacities of the bearing are 11600 and 17600 N respectively. The bearing is expected to be in use for 4000 hours of operation. Find out the reliability with which the life could be expected. 14M

**UNIT-III**

5. Design a connecting rod for a high-speed IC engine using the following data:

Cylinder bore = 125 mm

Length of connecting rod = 300 mm

Maximum gas pressure = 3.5 MPa

Length of stroke = 125 mm

Mass of reciprocating parts = 1.6 kg

Engine speed = 2200 rpm

Assume suitable data and state the assumptions you make. 14M

**OR**

6.     a. Why are connecting rods made of I sections?  
       b. What is the force on bolts of big end of connecting rod?  
       c. What is the difference between centre and overhung crankshafts?  
       d. Where do you use overhung crankshafts?  
       e. Where do you use centre crankshafts? 14M

**UNIT-IV**

7.     What do you mean by closely coiled spring? How a closely coiled helical spring is modeled for stress analysis and derives the expression for stresses and deflections. 14M

**OR**

8.     It is required to select a V-belt drive to connect a 15 kW, 2880 rpm normal torque A.C. motor to a centrifugal pump, running at approximately 2400 rpm, for a service of 18 hours per day. The centre distance should be approximately 400 mm. Assume that the pitch diameter of the driving pulley is 125 mm. 14M

**UNIT-V**

9.     A pair of spur gears with  $20^\circ$  pressure angle consists of a 25 teeth pinion meshing with a 60 teeth gear. The module is 5 mm, while the face width is 45 mm. The pinion rotates at 500 rpm. The gears are made of steel and heat treated to a surface hardness of 220 BHN. Assume that dynamic load is accounted by means of the velocity factor. The service factor and the factor of safety are 1.75 and 2 respectively. Calculate  
       (i) wear strength of gears;  
       (ii) the static load that the gears can transmit without pitting; and  
       (iii) Rated power that can be transmitted by gears. 14M

**OR**

10.    a) State any two reasons for adopting involute curve for gear tooth profile. 4M  
       b) In a pair of spur gears, the number of teeth on the pinion and the gear are 20 and 100 respectively. The module is 6 mm. Calculate  
          i. the centre distance;  
          ii. the pitch circle diameters of the pinion and the gear;  
          iii. addendum and dedendum;  
          iv. tooth thickness and bottom clearance;  
          v. the gear ratio. 10M

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Hall Ticket Number :

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**R-14**

**Code: 4G561**

III B.Tech. II Semester Supplementary Examinations May 2018

**Instrumentation and Control Systems**

( 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 about the Generalized measurement system and its functional elements. 8M  
b) List the advantages of the electronic instruments over electrical and mechanical instruments. 6M

**OR**

2. a) Explain about LVDT with a neat sketch. 8M  
b) Explicate the working principle of variable inductive transducers. 6M

**UNIT-II**

3. Describe the principle of operation of a McLeod gauge with a neat sketch and mention its applications, merits and demerits. 14M

**OR**

4. a) Explain the working principle of ultrasonic flow meter. 6M  
b) Describe the radiation pyrometer with a neat sketch. 8M

**UNIT-III**

5. a) Explain briefly about the different types of torsion meters. 10M  
b) Discuss the working principle of elastic load cells. 4M

**OR**

6. a) Describe briefly about the Strain gauge accelerometer with a neat sketch. 7M  
b) How can seismic instruments can be used as an accelerometer? 7M

**UNIT-IV**

7. a) Explain briefly about resistance strain gauges. 7M  
b) Describe about temperature compensation in strain gauges. 7M

**OR**

8. a) Discuss briefly about strain measuring techniques. 7M  
b) Distinguish the bonded and unbounded type of resistance strain gauges. 7M

**UNIT-V**

9. a) Explain briefly about the Servomechanisms. 7M  
b) Discuss about any three methods of block diagram reduction. 7M

**OR**

10. a) Represent the mathematical models for thermal systems with an example. 7M  
b) Sketch and explain Mason's rule? 7M

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**Code: 4G566**

III B.Tech. II Semester Supplementary Examinations May 2018

**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. Explain about the fourteen principles of Management. 14M

**OR**

2. Discuss in detail about Line and Staff organization with flow diagram. Also explain the merits and demerits of Line and Staff organization. 14M

**UNIT-II**

3. Define plant layout. Explain clearly about various types of plant layout with neat sketches. 14M

**OR**

4. The data pertaining to a project network is given below. Indirect cost of the project is Rs. 150 per week.

Activity	Normal duration ( weeks)	Cost (Rs.)	Crash Duration ( weeks)	Cost (Rs.)
1-2	4	400	3	775
1-3	8	250	5	475
2-3	6	350	4	450
2-4	9	450	7	800
3-4	5	300	3	600

- i) Draw the project network.  
ii) Determine the optimum duration and optimum cost of the project. 14M

**UNIT-III**

5. a) Define Method study. Explain about the steps in Method study. 07M  
b) Distinguish between micro-motion and memo-motion studies. 07M

**OR**

6. a) List and explain about various types of allowances. 04M  
b) The time study showed the average time for a quality control test for an item is 12.55 min. The performance rating is 100, and allowances are 60 minutes per 8 hour shift.  
(i) Calculate the labour standard for the operation.  
(ii) If this quality control test is alone repeatedly, how many tests per 8 hour shift could be completed on the average?  
(iii) If the quality control test technician's labour rate is Rs. 10 per hour, what is the standard labour cost per test? 10M

**UNIT-IV**

7. a) Explain about various costs associated with Inventory. 07M  
b) Write short note on Stores management and Stores records. 07M

**OR**

8. a) Distinguish between inspection and quality control. 07M  
b) Explain about double sampling plan with an example. 07M

**UNIT-V**

9. Clearly explain about the functions of HRM. 14M

**OR**

10. Define wage incentive. Explain about any three types of wage incentive schemes. 14M

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Hall Ticket Number :

**R-14**

**Code: 4G563**

III B.Tech. II Semester Supplementary Examinations May 2018

**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) Define Fit. Give classification of different types of fits and explain each of them with suitable example. 7M
- b) A hole and mating shaft are to have a nominal assembly size of 40 mm. The assembly is to have a maximum clearance of 0.15 mm and a minimum clearance of 0.05 mm. The hole tolerance is 1.5 times the shaft tolerance. Determine the limits for both hole and shaft. 7M

**OR**

2. a) What are various types of plug gauges? Sketch any two of them. 7M
- b) State and explain the "Taylor's principle of gauge design". 7M

**UNIT-II**

3. a) Explain the working principle of micrometer with help of neat sketch. What is the function of ratchet in micrometer? 7M
- b) With a neat sketch describe a method of measuring unknown angle of a component using sine bar. 7M

**OR**

4. a) Describe the working of NPL flatness interferometer with a neat sketch. 7M
- b) Explain the working principle of an Autocollimator with a diagram. 7M

**UNIT-III**

5. State and explain the different methods of measuring primary texture of a surface 14M

**OR**

6. a) Describe the working principle and advantages of electrical comparator with help of sketch. 8M
- b) Differentiate between mechanical and pneumatic comparators. 6M

**UNIT-IV**

7. a) Derive the formula for measuring the effective diameter of thread by 3-wire method. 7M
- b) With the aid of neat sketch explain the principle of Tool maker's microscope. 7M

**OR**

8. a) Explain the measurement of gear tooth thickness with aid of neat sketch. 8M
- b) What are Coordinate measuring machines (CMM)? Mention their types. 6M

**UNIT-V**

9. Explain with suitable sketches about various alignment tests performed on a lathe. 14M

**OR**

10. a) What is overlay coating? How is it produced? 7M
- b) What is surface treatment process? Explain briefly. 7M

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