Hall Ticket Number :										

R-14

Code: 4G564

III B.Tech. II Semester Supplementary Examinations Nov/Dec 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. In a gas turbine power plant, air is compressed through a pressure ratio of 7:1 from 20°C. After compression air is heated to a maximum permissible temperature of 800°C and expanded in two stages. Expansion ratio in each stage of turbine is 2.45. The air is being reheated in between the expansion stages to 750°C. Exhaust gases from turbine stages are preheated in a heat exchanger with an effectiveness of 0.8. Calculate: (i) The cycle efficiency, (ii) The work ratio, (iii)The work done per kg of air.
Assume the isentropic efficiencies of compressor and turbines are 0.82 and 0.84 respectively. 14M

OR

2. a) Briefly explain the working principle of Pulse Jet engine with a neat sketch 7M
   b) Write the basic differences between Propeller Jet and Turbojet engines. 7M

UNIT–II

3. An air-refrigeration systems operating on Bell Coleman cycle, takes in air from cold room at -6°C and compresses it from 1.2 bar to 6.4 bar. The index of compression being 1.24. The compressed air is cooled to 30°C. The ambient temperature is 20°C. Air expands in an expander in an polytropic expansion with index 1.34. Calculate: (i) COP of the system, (ii) Quantity of air circulated per minute for production of 1450 kg of ice per day at 0°C from water at 20°C., (iii) Capacity of the plant in terms of kJ/s. Consider, Cp =4.184 kJ/kgK for water, Cp = 1.005 kJ/kgK for air and latent heat of ice = 335 kJ/kg. 14M

OR

4. a) Write the merits and demerits of vapour compression refrigeration system over air refrigeration system. 7M
   b) Discuss briefly with *T-s* and *P-h* charts, the effect of (i) Sub-Cooling and (ii) Super-Heating of refrigerant on performance of VCR system. 7M

UNIT–III

5. Describe the working of a LiBr-H_2O vapour absorption refrigeration system with a neat sketch 14M

OR

6. The generator, evaporator and ambient temperatures in an vapour absorption refrigeration system are 125°C, -10°C and 32°C respectively. The actual COP is 55% of theoretical COP. If the plant capacity is 120 TOR, calculate the fuel consumption per hour. Consider calorific value of fuel is 42 MJ/kg. 14M

UNIT–IV

7. Atmospheric air at 40°C and 60% relative humidity is to be cooled and dehumidified to a state of saturated air at 15°C. The mass flow rate of atmospheric air entering the dehumidifier is 50 km/h. Neglecting any pressure drop, calculate:
   (i) The mass of water vapour removed
   (ii) The quantity of heat removed. 14M

OR

8. a) Describe the working of a summer air-conditioning system with a neat sketch. 7M
   b) Explain the concepts of (i) RSHF and (ii) GSHF 7M

UNIT–V

9. What are the different impurities in atmospheric air? Briefly explain the effect of these impurities on human health. 14M

OR

10. a) Briefly explain the working of an impact type humidifier with a neat sketch. 7M
    b) Explain different methods of air cleaning. 7M

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Hall Ticket Number :										

R-14

Code: 4G565

III B.Tech. II Semester Supplementary Examinations Nov/Dec 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. a) Discuss in detail the design procedure for journal bearing. 8M

   b) Discus the principle of hydrodynamic lubrication. 6M

OR

2. 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

UNIT–II

3. a) Why are taper roller bearings used in pairs? Discuss. 6M

   b) A ball bearing with a dynamic load capacity of 22.8 kN is subjected to a radial load of 10 kN. Calculate (i) the expected life in million revolutions that 90% of the bearings will reach; (ii) the corresponding life in hours, if the shaft is rotating at 1450 rpm; and (iii) the life that 50% of the bearings will complete or exceed before fatigue failure. 8M

OR

4. 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 capacity of the bearing, so as to select it from the manufacturer's catalogue based on 90% reliability. 14M

UNIT–III

5 Design a side crank for an IC engine to the following specifications. Bore diameter=150mm, stroke=190mm, length of the connecting rod=380mm, maximum pressure = 320Mpa, RPM=600, brake mean effective pressure =70Mpa. Design stress for the crank shaft=30Mpa. 14M

OR

6 Discuss in detail the design procedure of connecting rod for an IC engine. State the significance of whipping stresses. 14M

UNIT–IV

7 a) How leaf spring is modeled for stress and deflection analysis. Discuss the importance of uniform strength beam. 6M

   b) A semi-elliptic leaf spring consists of two extra full-length leaves and six graduated -length leaves, including the master leaf. Each leaf is 7.5 mm thick and 50 mm wide. The centre-to-centre distance between the two eyes is 1 m. The leaves are pre-stressed in such a way that when the load is maximum, stresses induced in all the leaves are equal to 350 N/mm2. Determine the maximum force that the spring can withstand. 8M

OR

8. Discuss the V-belt selection procedure from manufactures catalogue. 14M

UNIT–V

9. A pair of spur gears with 20° 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;
    (i) the gear ratio. 10M

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Hall Ticket Number :										

Code: 4G561

R-14

III B.Tech. II Semester Supplementary Examinations Nov/Dec 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 the Dynamic characteristics of measuring instruments. 7M

   b) Discuss briefly about the classification of instruments. 7M

OR

2. a) Classify the different types of transducers. Explain the working principle of Capacitive transducers. 6M

   b) Discuss about the Static characteristics of measuring instruments. 8M

UNIT–II

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

OR

4. a) Explain the working principle of Hot wire anemometer. 6M

   b) Discuss briefly about the temperature measurement instruments. 8M

UNIT–III

5. a) Explain the working principle of Pneumatic load cell with a neat sketch. 7M

   b) Describe the working principle of Piezoelectric accelerometer with a neat sketch. 7M

OR

6. a) Explain the strain gauge torsion meter with a neat sketch. 7M

   b) Illustrate the working principle of Vibrometer with a neat sketch. 7M

UNIT–IV

7. a) Discuss briefly about the Strain gauge alloys and materials. 7M

   b) Explain about resistance strain gauges with a neat sketch. 7M

OR

8. a) Classify the bonding techniques and explain with any one method. 7M

   b) Describe about temperature compensation in strain gauges. 7M

UNIT–V

9. a) Explain the differences between Open loop and Closed loop systems with suitable examples. 8M

   b) Discuss briefly about the transfer functions of elements. 6M

OR

10. a) Represent the Mathematical models for Mechanical systems with an example. 8M

    b) Discuss briefly about the Signal flow graphs. 6M

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