III B.Tech. II Semester Supplementary Examinations December 2017
Instrumentation and Control Systems
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks each**)
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1. a) Explain briefly about the static characteristics of a Measurement system.   7M
   b) Describe the working principle of LVDT with a neat sketch and state its applications.   7M

2. a) Explain the construction, working and theory of thermal conductivity gauges for measurement of vaccum.   8M
   b) Explain the basic principle of operation of Mc Leod vaccum gauge with a neat sketch.   6M

3. a) Explain the construction, working and application of the Hot wire anemometer.   6M
   b) Explain briefly about the bimetallic thermometers with a neat sketch.   4M
   c) Describe briefly about the working principle of Radiation pyrometer with a neat sketch.   4M

4. a) Explain the method of forces using elastic strain gauge load cells.   6M
   b) Describe briefly about Piezo electric accelerometer with a neat sketch   4M
   c) Explain the difference between absorption, transmission and driving dynamometers.   4M

5. a) Explain the bonded and unbounded strain gauges with neat sketches.   7M
   b) Discuss briefly about temperature compensation in strain gauges.   7M

6. a) Explain the Open loop and Closed loop control systems with suitable examples.   7M
   b) Describe briefly about the Mathematical modeling of the Thermal and Electrical systems.   7M

7. a) What are standard test signals? Give their representation in mathematical and graphically.   7M
   b) Discuss briefly about the steady state error and error constants.   7M

8. a) Construct Routh array and determine the stability of the system whose characteristic equation is $S^6+2S^5+8S^4+12S^3+20S^2+16S+16 = 0$. Also determine the number of roots lying on right half of S-plane, left half of S-plane and on imaginary axis.   8M
   b) Explain the procedure for magnitude and phase plots of Bode plot.   6M

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R-11 / R-13

Code: 1G563

III B.Tech. II Semester Supplementary Examinations December 2017
Metrology and Surface Engineering
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks each**)
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1. a) What is complete interchangeability? What are the advantages of having interchangeable manufacture? How is it different from selective assembly?

   b) What are shaft and hole basis systems? Specify conditions where each can be preferred.

2. a) State Taylor's principles of Gauge design. Explain how they can be used for applying guage tolerance in design of general gauges.

   b) What is the principle of a Sine bar? What are its accuracy requirements related to its construction? Why is a sine bar advised to be used for measurements below 45° ?

3. a) Sketch the working diagram of a Tool Microscope and explain how it can be used to measure centre distance between holes of a plate and Check screw thread parameters also.

   b) Sketch out the possible fringe patterns that are expected when an optical flat is placed on a test surface. How can they be interpreted?

4. a) Sketch the diagram showing terminology of surface texture of a machined surface and explain.

   b) Draw the working diagram of an LVDT and explain how it is used as comparator.

5. Discuss about the following related to screw threads.
   i. flank angle and pitch errors
   ii. 3-wire method of measuring effective diameter and best wire size.

6. Discuss about the alignment tests that should be performed on a drilling machine with neat sketch for each check-up.

7. Discuss about the following related to gear measurement.
   i. Testing of involute form
   ii. Measurement of chordal thickness

8. a) Write an account on preparation work before surface coating of metallic surfaces.

   b) Why is it necessary to carry out surface coatings? List out the methods of coating surfaces.

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III B.Tech. II Semester Supplementary Examinations December 2017

Thermal Engineering-III
(Mechanical Engineering)

Max. Marks: 70

Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks each**)
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1. In a gas turbine, a compressor takes in air at a temperature of 15°C and compresses it to four times the initial pressure with an isentropic efficiency of 82%. The air is then passed through a heat exchanger heated by the turbine exhaust before reaching the combustion chamber. In the heat exchanger 78% of the available heat is given to the air. The maximum temperature after constant pressure combustion is 600°C and the efficiency of the turbine is 70%. Neglecting all losses except those mentioned, and assuming the working fluid throughout the cycle to have the characteristics of air, find the efficiency of the cycle.   14M

2. A turbo-jet engine consumes air at the rate of 60.2 kg/s when flying at a speed of 1000 km/h. Calculate: (i) Exit velocity of the jet when the enthalpy change for the nozzle is 230 kJ/kg and velocity coefficient is 0.96. (ii) Fuel flow rate in kg/s when air fuel ratio is 70:1. (iii) Thrust specific fuel consumption. (iv) Thermal efficiency of the plant when the combustion efficiency is 92% and calorific value of the fuel used is 42000kJ/kg. (v) Propulsive power. (vi) Propulsive efficiency. (vii) Overall efficiency.   14M

3. A dense air refrigeration machine operates on reversed Brayton cycle and is required for 10 tons refrigeration capacity. The cooler pressure is 4.2 bar and refrigerator pressure is 1.4 bar. The air is cooled in the cooler to a temperature of 50°C and the temperature of air at inlet to the compressor is -20°C. For an ideal cycle determine the following. (i) COP of the system (ii) Mass of air circulated per minute (iii) Theoretical piston displacement of the compressor (iv) Net power per ton of refrigeration. Show the cycle on p-v and T-s diagrams. Take C_p = 1.07 kJ/kg-K   14M

4. A food storage requires a refrigeration system of 12 tons capacity at an evaporator temperature of -10°C, and condenser temperature of 25°C. The refrigerant ammonia is sub-cooled by 5°C before passing through throttle valve. The vapour leaving the evaporator coil is 0.97 dry. Find the COP and power required to run the plant. Neglect all losses. The properties of NH_3 are given below

Temperature (°C)	Liquid			Vapour		
	h_f (kJ/kg)	s_f (kJ/kg-K)	C_p (kJ/kg-K)	h_g (kJ/kg)	s_g (kJ/kg-K)	C_p (kJ/kg-K)
25	537.6	4.612	4.62	1708	8.54	2.8
-10	376.3	4.03	-	1675	10.23	-

14M

5. Draw a neat compact diagram of lithium bromide water absorption refrigeration system and explain its working. List out the major fields of applications of this refrigeration system.   14M

6. An air-conditioned plant is to be designed for a small office room for winter conditions.

   Outdoor conditions = 10°C DBT and 8°C WBT

   Required indoor conditions = 20°C DBT and 60% RH

   Amount of free air circulation = 0.3 m³/min/person

   Seating capacity = 50

   The required condition is achieved first by heating and then by adiabatic humidifying. Find the following: (a) Heating capacity of the coil in kW and the surface temperature required if the bypass factor of the coil is 0.32 (b) The capacity of the humidifier.   14M

7. With the aid of a neat sketch explain the working of an air to liquid heat pump for both heating and cooling systems.   14M

8. a) Define the term "effective temperature" and explain its importance in air conditioning systems. Describe the factors which affect effective temperature.   4M

   b) Define "human comfort" and explain factors which affect human comfort.   5M

   c) What are the important considerations in the design of air conditioning system?   5M

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Code: 1G562

III B.Tech. II Semester Supplementary Examinations December 2017

CAD / CAM

(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions

All Questions carry equal marks (**14 Marks each**)

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1. a)   Explain the four types of production

    b)   What is product cycle? With a neat sketch explain CAD/CAM Product cycle

    c)   What is the structure of a computing system?

2. a)   Explain how 2-D and 3-D transformation are done on a graphics element
    b)   Describe the various database models which are generally used in Geometrical Database
    c)   Perform a 45^0 of rotation of a triangle A(0,0), B(1,1), C(5,2) about the origin

3. a)   Explain how a Bezier curve is defined and Describe the parametric equations of a circular cone and tabulated cylinder

    b)   Investigate the statement "each segment of a B-spline curve is influenced by only k control points or   each control point affects only k curve segments". Use n = 3, k = 2,3,4.

4. a)   Discuss the basic elements of Numerical Control system with advantages and Limitations

    b)   What is fixed zero and floating zero?

    c)   What is absolute positioning and incremental positioning?

5. a)   Define process planning. Explain, with a neat diagram, the concept of retrieval CAPP
    b)   Discuss the various methods of grouping parts into families. List the benefits of GT.

6. a)   Classify and discuss various flexible manufacturing systems with Advantages

    b)   Discuss principles of material handling. Name and describe the five types of material handling devices.

7. a)   Distinguish between Automation and Computer Integrated Manufacturing.

    b)   What is meant by MRP II? Explain the scope, application, advantages and limitation of MRP II implementation to a manufacturing firm

8. a)   What are the objectives of computer-aided quality control? Spread a light over the contact inspection methods in quality testing.

    b)   Discuss the integration of computer aided quality control with CAD/CAM.

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III B.Tech. II Semester Supplementary Examinations December 2017
Design of Machine Elements-II
(Mechanical Engineering)

Max. Marks: 70   Time: 3 Hours

Answer any **five** questions
All Questions carry equal marks (**14 Marks each**)
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Use of Data hand book is permitted
Any missing data may be assumed suitably

1. a) What is a Journal   2M

   b) Design a journal bearing to withstand a load of 5886 N, speed of the journal is 1000 rpm. The journal is made of hardened steel and bearing is made of babbit. Operating temperature is 70⁰C and ambient temperature is 30⁰C. Check the design for thermal equilibrium and also determine the power loss at the bearing. The lubricant used is SAE 40 grade, and $\frac{l}{d} = 1.5$ 12M

2. a) Name any two functions of piston rings   2M

   b) A four stroke internal combustion engine has the following specifications: Brake power = 7.5 kW; Speed = 1000 r.p.m; Indicated mean effective pressure = 0.35 N/mm²; Maximum gas pressure = 3.5 N/mm²; Mechanical efficiency = 80%. Determine:
   i. The dimensions of the cylinder, if the length of stroke is 1.4 times the bore of the cylinder
   ii. Wall thickness of the cylinder, if the hoop stress is 35 MPa
   iii.Thickness of the cylinder head and the size of studs when the permissible stresses for the cylinder head and stud materials are 45 MPa and 65 MPa respectively.   12M

3. a) Explain the various stresses induced in the connecting rod.   4M

   b) A gas engine has a piston of 100mm diameter. The explosion pressure is 3.0 MPa. The length of the connecting rod 373mm. Design I-section for the connecting rod having same thickness for flanges and webs. Width of the flange and overall depth of the section are 4 times and 5 times the web thickness. The Rankie's constant is 7500 and crippling stress is 330 MPa   10M

4. a) Differentiate between straight beam and curved beam   2M

   b) The cross section of a steel crane hook is a trapezium with an inner side of 50mm and outer side of 25mm. The depth of the section is 64mm. The centre of curvature of the section is at a distance of 64mm from the inner edge of the section and line of action of the load is 50mm from the same edge. Determine the maximum load the hook can carry if the allowable strength is limited to 60MPa.   12M

5. a) What are the factors to be considered for selection of belt drives. 2M

   b) Two shafts 1 metre apart are connected by a V-belt to transmit 90 KW at 1200 rpm of a driver pulley of 300mm effective diameter. The driver pulley rotates at 400rpm. The angle of groove is 40^0 and the co-efficient of friction between the belt and the pulley rim is 0.25. the area of the belt section is 400mm^2 and the permissible stress is 2.1 MPa. Density of belt material is 1100kg/m^3. Calculate the number of belts required and the length of the belt. 12M

6. a) Derive the Lewis equation for the beam strength of a gear tooth. 4M

   b) Design a pair of helical gears to transmit power of 15 kW at 3200 rpm with speed reduction 4:1, pinion is made of cast steel 0.4% C–untreated. Gear made of high grade C.I. Helix angle is limited to 26^0 and not less than 20 teeth are to be used on eighter gear. 10M

7. a) What are the functions of springs 4M

   b) Design a valve spring for an automobile engine, when the valve is closed, the spring produces a force of 45N and when it opens, produces a force of 55N. The spring must fit over the valve bush which has an outside diameter of 20mm and must go inside a space of 35mm. The lift of the valve is 6mm. The spring index is 12. The allowable stress may be taken as 330MPa and modulus of rigidity is 80GPa. 10M

8. a) Explain overhauling and self-locking 4M

   b) The mean diameter of the square threaded screw having pitch of 10 mm is 50 mm. A load of 20 kN is lifted through a distance of 170 mm.

   Find the work done in lifting the load and the efficiency of the screw, when

   i. The load rotates with the screw, and

   ii. The load rests on the loose head which does not rotate with the screw. The external and internal diameter of the bearing surface of the loose head are 60 mm and 10 mm respectively. The coefficient of friction for the screw and the bearing surface may be taken as 0.08. 10M

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