R-11

III B.Tech. II Semester Regular Examinations, May 2015
## *Metrology and Surface Engineering*
(Mechanical Engineering)

Max. Marks: 70   **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Convert the unilateral dimension $20^{+0.4}_{-0.5}$ mm in to equal bilateral system   7M

    b) Write the basic approaches of Selective Assembly.   7M

2. a) Name few line standards and end standards along with their accuracies.   7M

    b) What are the manufacturing processes of slip gauges? Built up a dimension 120.635mm using standard slip guage boxes.   7M

3. a) With optical diagram explain the working principle of a tool maker microscope. Establish the methodology to measure various Angles of SPCT(single point cutting tool)   7M

    b) Distinguish between straightness and flatness of given surface. Explain the method of determining the flatness from the straightness values of the given surfaces.   7M

4. a) According to ISO a Surface texture is shown as given below:
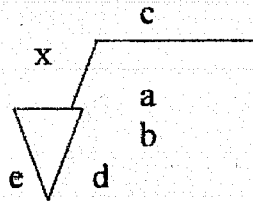
    Give each label meaning. Also define terms to asses surface roughness.   7M

    b) Classify the comparators and give the constructional details of Sigma mechanical comparators.   7M

5. a) What are common profile errors in a screw thread? Explain two or three wire method to determine the effective diameter of a screw.   7M

    b) Write short notes on "profile thread gauges".   7M

6. a) Prepare alignment test sheet to check working of various elements on Lathe machine.   7M

    b) What are the performance parameters that can checked with alignment tests. Describe them.   7M

7. a) Describe the following methods/instruments for gear measurements:--
        (i) Gear tooth verneir   (ii) Base tangent method (iii) dial gauges   7M

    b) Describe various elements of CMM (COORDINATE MEASURING MACHINE)   7M

8. a) Describe various types of surface treatments along with their applications.   7M

    b) Describe the process creates thin films of sulfide and oxide films   7M

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III B.Tech II Semester Regular & Supplementary Examinations May 2015

Thermal Engineering-III
(Mechanical Engineering)

Time: 3 hours   Max Marks: 70

Answer any FIVE of the following
All questions carry equal marks (14 Marks each)

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1. a) Derive the optimum pressure ratio and maximum efficiency of gas turbine cycle for maximum net work output.   6M

   b) In a gas turbine the compressor is driven by the high pressure turbine. The exhaust from the high pressure turbine goes to a free low pressure turbine which runs the load. The air flow rate is 20 kg/s and the minimum and maximum temperatures are respectively 300 K and 1000 K. The compressor pressure ratio is 4. Calculate the pressure ratio of the low pressure turbine and the temperature of exhaust gases from the unit.   8M

2. A jet propulsion unit consists of compressor, combustion chamber, turbine and nozzle. The air at 0.65 bar and 272 K is compressed in the compressor to 3 bar. η_c = 0.85. The temperature of the gases at inlet to the turbine is 7000 C, and the η_t=0.80. The gases coming out of the turbine are expanded in a nozzle to a pressure 0.564 bar. The η of the nozzle is 0.90. Neglecting the pressure and mechanical losses and fuel mass, find the following:

   (a) A/F ratio used assuming C.V. of fuel 44000 kJ/kg; (b) Power required to run the compressor; (c) Pressure of the gases entering the nozzle; (d) The thrust developed per kg of air per sec; Take Cp=1.005 kJ/kg-K, γ = 1.4 for air and Cp = 1.1514 kJ/kg-K, γ = 1.33 for gases; Speed of jet propulsion unit is 720 km/h.   14M

3. a) How does dry air rated temperature help in comparison of different types of air craft refrigeration systems? Explain.   6M

   b) A dense air closed Bell-Coleman refrigeration system working between 4 bar and 16 bar extracts 125 Mj/h. The air enters the compressor at 50C and enters the expander at 230C. The compressor is double acting and its stroke = 30 cmm; γ for air = 1.4; mechanical efficiency (compressor) = 82%; mechanical efficiency (expander) = 87%; Cp for air = 1.005kJ/kgk; R for air = 0.287kJ/kgk. Assume the unit runs at 300 rpm, find: (i) Power required to runs the unit (ii) Bore of the compressor (iii) Refrigerating capacity in tones. Assume isentropic compression and expansion.   8M

4. a) Explain the impact of condenser temperature and evaporator temperature on the C.O.P of the system and substantiate the statements.   6M

   b) R-12 is used in a vapour compression refrigeration system with evaporator pressure of 1.6 bar and the condenser pressure of 9 bar. The refrigerant leaves the condenser at $30^0 C$ sub cooled and at the rate of 15 kg/min. Calculate the refrigerating effect, refrigerating load (in TR), compressor input and COP of the system.   8M

5. a) Draw the specific enthalpy and concentration diagram for actual vapour absorption refrigeration system and explain the salient features of this diagram along with bubble point and dew point temperatures.   6M

   b) A vapour absorption system is designed in which heat is supplied to NH_3 generator by condensing steam at 2.2 bar and 94% dry. The temperature to be maintained in the refrigerator is -8 ^0C. The temperature of the atmosphere is 29 ^0C. Find the maximum COP possible of the refrigerator. If the refrigeration load is 25 tons and actual COP is 75% of maximum COP, find the mass of steam required per hour.   8M

6. a) How to develop a psychometric chart? Discuss the importance of psychometric chart in order to understand the requirement of air conditioning system.   6M

   b) For the inside design conditions of 20^0C DBT and 50% RH, outside conditions are 42^0C DBT and 27^0C WBT with laboratory sensible load of 30 kW and latent load of 25 kW, ventilation air used is 75 m^3/min, cooling coil with apparatus DPT of 9^0C and BPF of 0.08. Calculate the reheat amount required, supply air quantity and other salient point values.   8M

7. a) How does the dehumidifier function? Explain any one type of dehumidifier with suitable diagram.   7M

   b) Where do you use heat pumps? Explain different types of heat pumps used and discuss the salient features of each one.   7M

8. a) What is the concept of effective temperature of air conditioning system? And how to achieve the required effective temperature.   6M

   b) In an industrial process, outdoor is at 35^0C DBT and 80% RH, and it require 20^0C DBT and 70% RH with an amount of outdoor air supplied is 400 m^3/min, coil DPT of 10^0C. Required condition is achieved by cooling and dehumidifying and then by heating. Calculate the capacity of the cooling coil and BPF. If heating coil BPF is 0.2, then calculate the capacity of it and heating surface temperature.   8M

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III B.Tech. II Semester Regular Examinations, May 2015
CAD / CAM
(Mechanical Engineering)

Max. Marks: 70   **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) With the help of neat sketch, explain the concept of product life cycle in a computerized manufacturing environment.   7M

   b) Discuss the working of a direct view storage tube display system and mention its limitations   7M

2. a) What is meant by a database model? Explain about network, hierarchical and relational database models with neat sketches.   7M

   b) A triangle ABC having vertices A (1,1), B (1,7) and C (5,4) is scaled by 3 units in x-direction and then rotated by 30^0 in anticlockwise direction keeping point (1,1) fixed. Find the transformation.   7M

3. a) Explain the parametric representation of a straight line, circle, ellipse and parabola   6M

   b) Develop the equation of a Bezier curve, find the points on the curve for t =0, 0.25, 0.5, 0.75 and 1 and plot the curve for the following data. The coordinates of the four control points is given by P_0 (0,0), P_1(0.2), P_2 (4,2) and P_3 (4,0).   8M

4. a) Define a machining centre and discuss the working of a turning centre with a neat sketch.   6M

   b) The part drawing of a component is shown in Fig. below. Five holes of 12.5 mm diameter are to be drilled at five places. The speed and feed rate are 592 RPM and 100 mm/min respectively. The machine has a floating zero feature and absolute positioning. The   thickness of plate is 10 mm. Write the manual part program
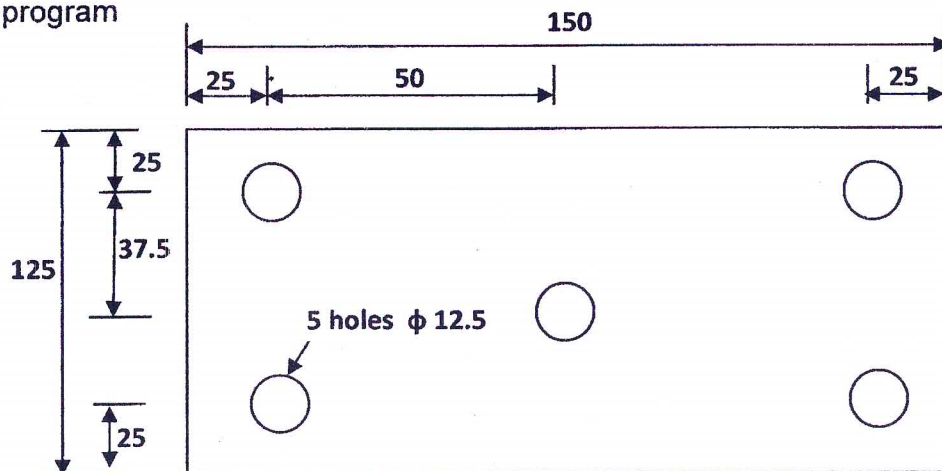

Fig. 1

All dimensions are in mm

8M

5. a) Define Group Technology and discuss about Production Flow Analysis (PFA) with an example. Also mention the advantages and limitations of PFA. 8M

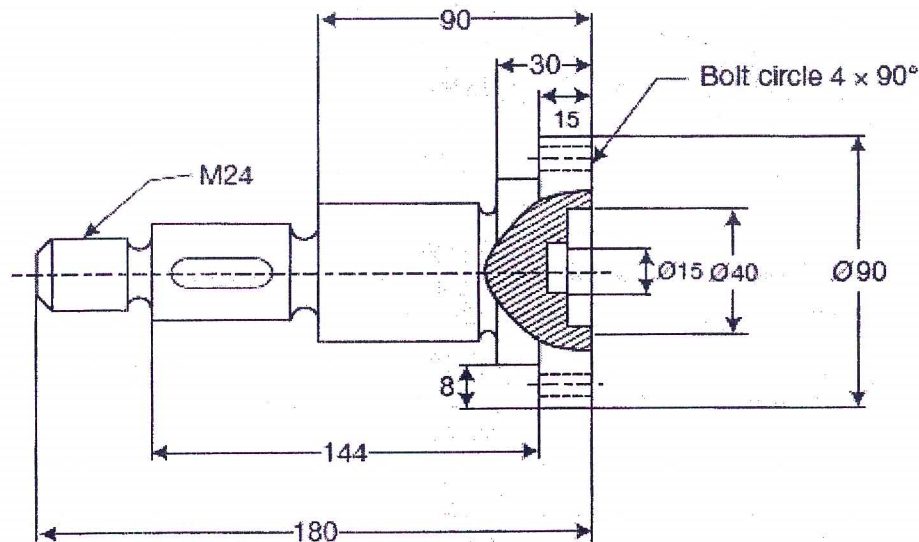   b) Develop the opitz form code (first 5 digit) with justification for the component shown in Fig. 2.

Fig. 2 6M

6. a) Define FMS and mention its components. List its advantages and limitations 4M

   b) Mention the principles of material handling and classify various types of material handling systems. 5M

   c) Discuss the role of human labour in manufacturing systems 5M

7. a) Discuss the terms aggregate planning, material planning and capacity planning 7M

   b) What is meant by MRP I? Explain the working principle of MRP I with a neat sketch. 7M

8. a) Define the term CAQC and classify various types of CAQC systems. Explain the working of a CMM. 7M

   b) With a neat sketch, explain the working of a machine vision system. 7M

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III B.Tech. II Semester Regular Examinations, May 2015
Design of Machine Elements-II
(Mechanical Engineering)

Max. Marks: 70   Time: 03 Hours

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. A rolling contact ball bearing is to be selected to support an overhung countershaft. The shaft speed is 720r.p.m.The bearing is to have 99% reliability corresponding to a life of 24000 hours. The bearing is subjected to an equivalent radial load of 1kN.Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability.

2. Design a trunk type CI piston for an IC engine for the following data:
    Diameter of the cylinder=100mm, Stroke=150mm, Maximum explosion pressure =3.5MPa, Maximum permissible tension for CI for the design of head thickness is 30Mpa, And flexural stress for the pin may be taken from 90 to 120Mpa. The gudgeon pin Must be hardened and ground and should turn in phosphor bronze bushing bearing pressure should not exceed 20Mpa.

3. Design and draw a connecting rod of a petrol engine from following data using design data book.

Dia of Piston	: 110 mm
Mass of reciprocating parts	: 2 Kg
Length of connecting rod	: 325 mm
Stroke	: 150mm
Speed	: 1500RPM
Maximum explosion pressure	: 2.5 Mpa.

    Any other data required for design may be assumed.

4. a) Derive stresses and deflections in curve beams while using trapezoidal cross section

    b) What is the difference between straight and curved beam?

5. a) Obtain an expression for the length of a belt in 1. An open belt drive; and 2. A cross belt drive.

    b) A belt drive consists of two V-belts in parallel, on grooved pulleys of the same size. The angle of the groove is 30°. The cross-sectional area of each belt is 750 mm2 and μ = 0.12. The density of the belt material is 1.2 Mg/m3 and the maximum safe stress in the material is 7 MPa. Calculate the power that can be transmitted between pulleys 300 mm diameter rotating at 1500 r.p.m. Find also the shaft speed in r.p.m. at which the power transmitted would be maximum.

6. A pair of straight teeth spur gears is to transmit 20KW when the pinion rotates at 300rpm.The velocity ratio is 1:3.The allowable static stresses for the pinion and gear materials are 120MPa and 100MPa respectively. The pinion has 15 teeth and its face width is 14times the module. Determine 1.Module, 2. Face width and 3.Pitch circle diameters of both the pinion and the gear from the standpoint of strength only, taking into consideration the effect of dynamic loading.

7. a) Write explanatory notes on energy storage capacity in springs 6M

    b) A helical spring is made from a wire of 6mm diameter and has an outside diameter of 75mm. If the permissible shear stress is 350MPa and modulus of rigidity is 84kN/mm², find the axial load which the spring can carry and the deflection per active turn.

8. The lead screw of lathe has ACME threads of 50 mm outside diameter and 8 mm pitch. The screw must exert an axial pressure of 2500 N in order to drive the tool carriage. The thrust is carried on collar 110 mm outside diameter and 55mm inside diameter and lead screw rotates at 30 rpm. Determine the power required to drive the screw and efficiency of the lead screw. The coefficient of friction of 0.15 for the screw and 0.12 for the collar.

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III B.Tech. II Semester Regular Examinations, May 2015
Industrial Management
(*Mechanical Engineering*)

Max. Marks: 70   **Time: 03 Hours**

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Explain the principles of management as listed out by Henry Fayol.   7M

   b) Compare the assumptions of Mc. Gregor's theory X and theory Y about employees.   7M

2. a) What do you understand by departmentation? Explain briefly different types of departmentation.   7M

   b) Explain the principles of an organization structure.   7M

3. a) Explain the following with reference to plant layout

        i) Product flow   ii) Data collection   8M

   b) Explain the various factors to be considered in plant layout   6M

4. a) Define method study. What are the criteria for selecting a process for study? Explain   8M

   b) A work-element is timed as 1.2, 1.0, 1.4, 1.35, 1.25, 1.27 and 1.30. Does this data provide 95% confidence level and ± 5% accuracy. If not, how many more additional data is needed to satisfy the requirements.   6M

5. a) What are the main functions of stores organization? Discuss.   7M

   b) An electric motor manufacturer needs 60 shafts per day. The machine shop can produce 200 shafts /day. The set up cost is Rs. 400 and the holding cost Re. 0.01 per shaft per day. The manufacturing cost Rs. 10.00 per shaft. Find the minimum cost procurement quantity. No shortages are allowed.   7M

6. a) What are the advantages of PERT and CPM?   4M

   b) Tasks A,B,C....,H, I constitute a project. The precedence relationships are
   A<D; A<E; B<F; D<F; C<G; C<H; F<I; G<I.

   Draw a network to represent the project and find the minimum time of completion of the project when time, in days, of each task is as follows:

Task:	A	B	C	D	E	F	G	H	I
Time:	8	10	8	10	16	17	18	14	9

   Also identify the critical path?   10M

7. a) Differentiate between single and double sampling plans used in Quality Control.   7M

   b) State the outstanding features and draw backs of ISO 9000 series of standards.   7M

8. a) Describe the various methods of job evaluation   7M

   b) Discuss the main objectives of Human Resources Management.   7M

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III B.Tech. II Semester Regular Examinations, May 2015
Instrumentation and Control Systems
(Mechanical Engineering)

Max. Marks: 70

Time: 03 Hours

Answer *any five* questions
All Questions carry equal marks (14 Marks each)
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1. a) Explain the functions of various elements of generalized measuring system with block diagram.

   b) Explain the principle of operation of piezoelectric transducers. Why their use is limited to the measurement of dynamic quantities only?

2. a) Explain with neat sketch the principle of working of Ionization Gauge?

   b) What is the working principle of bourdon gauge? Explain with neat diagram.

3. a) Explain the principle of working of thermo couples. State the law of intermediate temperatures and intermediate metals for thermo couples.

   b) Why is emissivity important in radiation temperature measurement?

4. a) Explain with a neat sketch the principle of working of a pneumatic load cell for the measurement of force?

   b) Discuss the principle of working of a seismic instrument explaining how it can be used to measure displacement, velocity and acceleration.

5. a) Explain the principle of operation of electrical resistance strain gauge?

   b) What do you understand by temperature compensation in connection with the electrical resistance strain gauges? Explain clearly the methods used in practice for temperature compensation.

6. a) Explain closed loop system with suitable example.

   b) Derive transfer function for armature controlled D.C motor.

7. a) Explain the standard test signals used with neat diagrams.

   b) Explain the steady state errors and error constants and derive these for various standard test signals.

8. a) By means of the Routh criterion, determine the stability of the systems represented by the following characteristic equations.

   i) $s^4 + 2s^3 + 8s^2 + 4s + 3 = 0$

   ii) $s^4 + 2s^3 + s^2 + 4s + 2 = 0$

   b) A unity feedback control system has an open loop transfer function
   G(s)=K/s(s²+4s+13)

   Sketch the root locus plot of the system by determining the centroid, number and angle of asymptotes.

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