

Code : 1G563

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
(AUTONOMOUS)

III B.Tech. II Semester Regular Examinations, June 2014***Metrology and Surface Engineering******(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) Define the terms:
(i) Clearance
(ii) Interference
(iii) Allowance fit
Draw a conventional diagram for explicit representation of these terms on a shaft and hole pair? 6M
- b) Write a short note on interchangeable manufacture and the 'selective assembly of machine parts? 8M
2. a) Distinguish between 'line standards' and 'end standards'. How are end standards derived from line standards? Give examples of these two types of standards. 7M
- b) How are angular measurements made? Describe the instrument for angular measurement correct upto a few seconds. 7M
3. a) Explain the construction and working of a micro optic autocollimator with sketch. 7M
- b) Distinguish between straightness and flatness. List out the methods of measuring each of these. 7M
4. a) What are pneumatic comparators? What are its advantages and applications? 7M
- b) Describe measurement using Talysurf? 7M
5. The following elements of screw threads are to be measured:
(i) Outer Diameter (ii) Effective Diameter
(ii) Pitch Diameter
Explain the methods with sketches wherever possible. 14M
6. Describe two methods of testing a centre lathe for accuracy of facing. Why must the surface generated not be convex? 14M
7. a) Explicate the measurement of effective diameter using thread micrometer? 7M
- b) Describe the features of the coordinate measuring machine (CMM)? 7M
8. Describe the following coating processes
(i) Galvanizing (ii) Electro static plating 14M

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(AUTONOMOUS)**III B.Tech. II Semester Regular Examinations, June 2014****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) Discuss briefly the methods employed for improvement of thermal efficiency of open cycle gas turbine plant. 6M
 b) A gas turbine has a pressure ratio of 6/1 and a maximum cycle temperature of 600°C . The isentropic efficiencies of the compressor and turbine are 0.82 and 0.85 respectively. Calculate the power output in kW of an electric generator geared to the turbine when the air enters the compressor at 150°C at the rate of 15 kg/s. Take: $C_p = 1.005 \text{ kJ/kg K}$ and $\gamma = 1.4$ for the compression process, and take $C_p = 1.11 \text{ kJ/kg K}$ and $\gamma = 1.333$ for the expansion process. 8M
2. Air enters a jet propulsion engine at the rate of 2100 kg/min at 15°C and 1 bar and is compressed adiabatically to 4 times the entry pressure and to a temperature of 180°C . The products of combustion enter the turbine at 815°C and then enter the tail nozzle at 650°C . Neglecting the ram effect and the mass of the fuel, assuming that the isentropic efficiency of compressor and turbine to be same and nozzle efficiency as 90%, find: (a) The isentropic efficiency of turbine and compressor; (b) Power required to drive the compressor; (c) Exit speed of gases; (d) Thrust created when flying at 800 kg/hr. 14M
3. a) Differentiate between open and dense air systems and discuss the importance of dense air used in the air refrigeration systems. 6M
 b) The cabin pressure of Bootstrap air refrigeration system is maintained at one atmosphere. The cooling air temperature entering the heat exchanger is 32°C and compressed air leaving the primary heat exchanger at 64°C . The refrigerated air required entering the cabin at 4.5°C . Calculate (i) temperature of air entering the cooling turbine, (ii) discharge pressures of compressors and (iii) COP. Take turbine efficiency as 85%, secondary compressor is 77 % and secondary heat exchanger effectiveness is 0.9. 8M
4. a) Explain practical vapour compression refrigeration cycle with suitable modifications for the improvement in ideal vapour compression refrigeration system. 6M
 b) A refrigerating machine works on ammonia between pressure limits of 2.36 and 15.54 bar. If the refrigerant is sub cooled by 10°C before throttling, determine the improvement in COP over simple vapour compression cycle. Had the refrigeration system been designed corresponding to sub cooled state as the upper saturation temperature, find the improvement in COP. 8M

5. a) Draw a line diagram of Lithium Bromide – water absorption refrigeration system and explain its working principle. 6M
- b) An ammonia absorption refrigeration system is to remove 1,60,000 kJ/min from a source to be kept at a constant temperature of -2°C . Heat is supplied to the refrigerator by steam condensing at atmospheric pressure. Heat is rejected from refrigerator to the atmosphere at 28°C . Find: i) Quantity of heat supplied to the refrigerator per minute assuming actual C.O.P is 70% of ideal C.O.P. ii) Quantity of steam required in kg per ton of refrigeration per hour. 8M
6. a) What is the importance of RSHF, GSHF and ESHF? Under what circumstances these factors are being used? Explain. 6M
- b) For outdoor conditions of 48°C DBT and 25°C WBT to the capacity of 1450 m^3 volume, air conditioned to be maintained at 20°C DBT and 50% RH. The sensible heat load 25 kW, 22% fresh air is supplied. ADP of the coil is 10°C and BPF is 0.18. Calculate the condition and mass flow rate of supply air and total refrigerating plant load. 8M
7. a) Draw the circuit diagrams different types of heat pumps and explain their applications. 7M
- b) What are different types of humidifiers used in air conditioning system? Explain them. 7M
8. a) What is comfort chart for air conditioning systems? Explain the use of comfort chart in designing summer air conditioning system. 6M
- b) A big shop is air-conditioned for sensible load of 58.15 kW and latent load of 14.55 kW. The inside design conditions are 25°C DBT and 50% RH and outside design conditions are 40°C DBT and 27°C WBT. 70 m^3 per min fresh (ventilation) air is supplied to the shop. Determine (i) The ventilation load; (ii) Total load to be taken by the plant (iii) Effective sensible heat factor; (iv) Apparatus dew point; (v) Dehumidified air quantity (vi) Conditions of air entering and leaving the apparatus. Take the bypass factor of the cooling coil as 0.15. 8M

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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III B.Tech. II Semester Regular Examinations, June 2014

CAD/CAM

(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

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

* * * * *

1. a) With a neat sketch, explain the product cycle in a computerized manufacturing environment, 7M
 b) List various types of storage devices used in CAD/CAM hardware and explain about the working of at least two of them. 7M
2. a) With a neat sketch, explain the working principle of a colour raster refresh display system. 6M
 b) A triangle is defined in a two dimensional coordinate system by its vertices (0,2), (0,3) and (1,2). Perform the following transformations on this triangle: (i) Rotate the triangle by 45° about the origin. (ii) Rotate the triangle by 45° about (-1,-1) 8M
3. a) What are the various requirements of geometric modeling? 6M
 b) A cubic Bezier curve is described by the four control points: (0,0), (2,1), (5,2), (6,1). Find the tangent to the curve at $t = 0.3$. 8M
4. a) Distinguish between NC and CNC Machines 4M
 b) The component to be machined is shown in Fig.1. It is assumed that the pocket is through and hence only outside is to be machined as a finish cut of the pocket. The tool to be used is a 20 mm diameter slot drill. The setting is done with point A as reference (0, 0, 0) and the reference axes are along X and Y directions. Write NC part program for machining the component. 10M

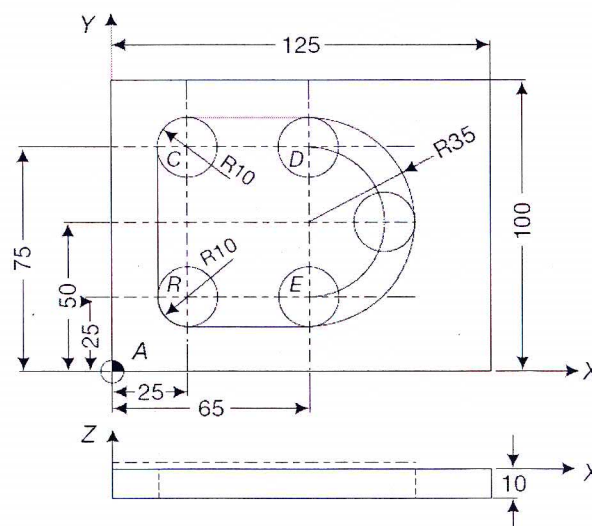


Fig.1

10M

5. a) Discuss about Production Flow Analysis and mention the advantages and limitations 4M
 b) Develop the opitz form code (first 5 digit) with justification for the component shown in Fig.2.

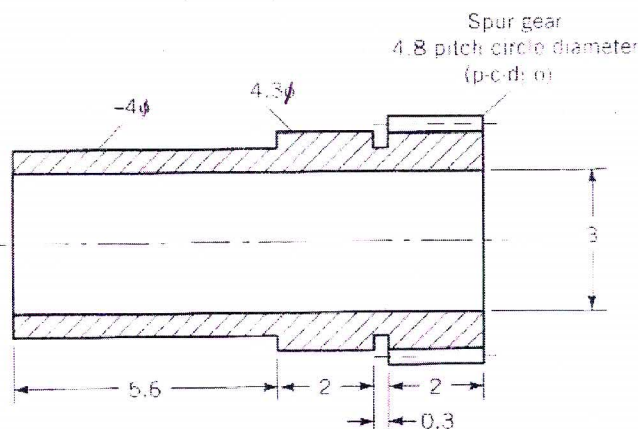


Fig.2

5M

- c) What is meant by CAPP? Discuss about the working of a generative CAPP system with a neat sketch. 5M
6. a) Define FMS and discuss about the various important elements of FMS system 4M
 b) What is meant by JIT? Discuss about working of a JIT system 4M
 c) Discuss the role of Human Labour in a Manufacturing System 6M
7. a) Define Capacity Planning and mention its significance in a manufacturing industry 4M
 b) With a neat sketch discuss the three phases in a shop floor control system 6M
 c) Distinguish between MRP I and MRP II 4M
8. a) Mention the objectives of a computer aided quality control 3M
 b) Explain the working of a CMM with a neat sketch and mention its advantages and limitations 7M
 c) Discuss the integration of CAQC with CAD/CAM 4M

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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III B.Tech. II Semester Regular Examinations, June 2014

Design of Machine Elements-II

(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

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

* * * * *

1. a) Explain the desirable properties required for a good bearing material. 4M
 b) The following data refers to the journal bearing of a steam turbine.
 Load on the journal = 3 KN. Journal speed = 1600 rpm.
 Bearing diameter = 50 mm Bearing length = 75 mm.
 Diametral clearance = 0.001 Lubricating oil used = SAE20
 Oil film operating temperature = 60°C. Ambient temperature = 15.5°C.
 Determine the heat generated and heat dissipated. 10M
2. a) Discuss the design of a piston head based on (i) strength, and (ii) thermal 6M
 b) The following data relate to a slow speed oil engine working on four stroke cycle:
 Indicative power = 15 KW
 Speed = 300 rpm
 Maximum explosive pressure = 2.1 MN / m²
 Mean effective pressure = 0.56 MN / m²
 Design (i) the suitable piston rings, and (ii) piston pin 8M
3. a) What are the cross-sections commonly employed for connecting rods? Why I-section is chosen for high-speed I.C engines? 4M
 b) Design a connecting rod of I-section for four-stroke petrol engine with the following data:
 Diameter of the piston = 85 mm
 Stroke = 125 mm
 Weight of the reciprocating parts = 16 N
 Length of connecting rod (center to center) = 300 mm
 Engine speed = 2200 rpm (with possible over speed of 3000 rpm)
 Compression ratio = 6.8: 1
 Probable maximum explosion pressure
 (Assume shortly after dead center, say when 30°) = 3.5 MPa. 10M

4. a) Explain why non-symmetrical sections are employed for the design of crane hooks or machine frames. 4M
- b) A punching press, used for stamping sheet metal, has a punching capacity 75 kN. The critical section of the press is shown in Figure-1. Calculate the maximum stress in the section of the frame.

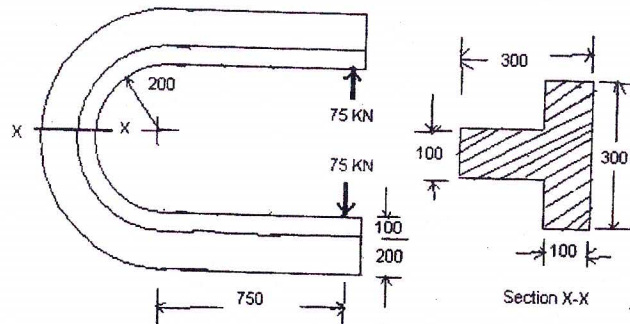


Figure-1

5. a) What are the advantages and disadvantages of chain drive over belt drive. 10M
- b) Design a chain drive to run a blower at 600 rpm. The power to the blower is available from a 8 kW motor at 1500 rpm. The center distance is to be kept at 800 mm. 4M
6. A pair of helical gears are to transmit 20 Kw. The teeth are 20° stub in diametral plane, and have a helix angle of 45°. The pitch circle diameter of the pinion is 60 mm and operates at 5600 rpm. The pitch circle diameter of the gear is 240 mm. If the pinion and gear are both made of the same material, having static strength of 100 Mpa, determine a suitable module and face width. Also check the design for dynamic and wear loads. 10M
7. a) What are the functions and applications of springs? 14M

- b) The particulars of concentric helical springs are given below: 4M

	Mean diameter mm	Wire diameter mm	Total Number of coils	Free length mm
Inner Spring	30	4.064	10	---
Outer Spring	40	4.877	12	80

The system is subjected to an axial load of 500 N. Determine the deflection load resisted by each spring, when the free length of the inner spring is (i) 90 mm and (ii) 70 mm. Take $G = 0.84 \times 10^5 \text{ N/mm}^2$ for both the springs.

8. a) Why are square threads preferable to V-threads for power transmission? 10M
- b) The lead screw of lathe has Acme threads of 50 mm outside diameter and 8 mm pitch. The screw must exert an axial load of 2500 N in order to drive the tool carriage. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter. The lead screw rotates at 30 rpm. Determine (i) power required to drive the screw and (ii) efficiency of the screw. Assume the coefficient of friction is 0.15 for screw and 0.12 for collar. 4M

10M

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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III B.Tech. II Semester Regular Examinations, June 2014

Industrial Management
(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) Discuss on Maslow's Hierarchy of Human Needs. 7M
b) Explain Hertzberg's Two Factor Theory of Motivation. 7M
2. a) Describe lean and flat organization structure systems. 7M
b) Discuss Departmentation and Decentralization, 7M
3. a) Discuss the factors affecting the plant location 7M
b) What are the types of plant layout employed 7M
4. a) What are the various types of associated charts used in work study 7M
b) How standard time calculation is done in work measurement 7M
5. a) Discuss the functions, types, associated costs of inventory 7M
b) What are inventory classification techniques, explain any one. 7M
6. With the help of following data, draw the network?
(a) Draw the network.
(b) Find the project duration for following project.
(c) Identity critical path.

Activity	1-2	1-3	1-4	2-4	2-5	3-4	3-7	4-6	4-7	5-6	5-7
Time (months)	4	6	12	7	11	7	8	8	13	4	7

14M

7. a) What are the attributes control charts, describe any one in detail. 7M
b) Describe single sampling and double sampling plans 7M
8. a) Discuss on functions of HRM, 7M
b) Discuss the different types of wage incentive schemes 7M

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**ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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III B.Tech. II Semester Regular Examinations, June 2014

**Instrumentation and control systems
(Mechanical)**

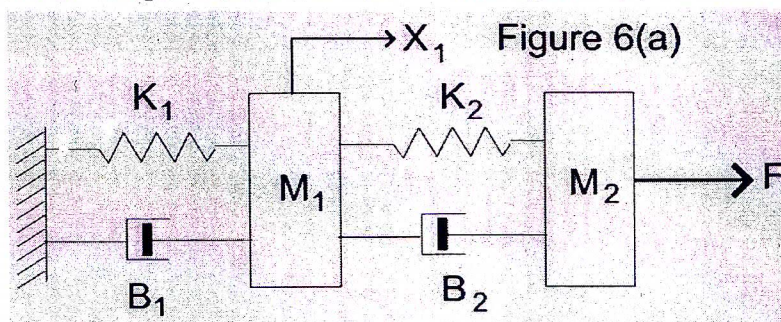
Time: 3 hours

Max Marks: 70

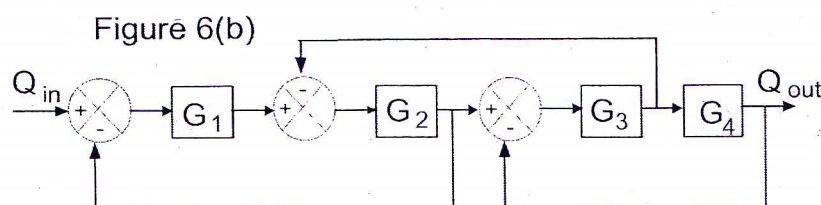
*Answer any FIVE of the following
All questions carry equal marks (14 Marks each)*

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1. a) Explain the construction of LVDT with a sketch and explain and comment on its suitability for measurement of displacement. 6M
 b) A balloon carrying a first-order thermometer with a 15-s time constant rises through the atmosphere at 6 m/s. Assume temperature varies with altitude at $0.15^\circ\text{C}/30\text{m}$. The balloon radios temperature and altitude readings back to the ground. At 3000 m the balloon says the temperature is 0°C . What is the true altitude at which 0°C occurs? 8M
2. a) Explain the construction and working of McLeod vacuum gage with neat sketches. 7M
 b) Explain the purpose of Thermal Conductivity gage and illustrate the implications of using thermal conductivity gage. 7M
3. a) Explain the working principle of Constant-current-type Hot Wire Anemometer. 7M
 b) Explain the functioning of ultrasonic flow meter with a neat sketch. 7M
4. a) Explain the functioning of a strain gage type load cell with neat sketch. 7M
 b) Explain the working principle and construction of piezoelectric accelerometer. 7M
5. a) What is temperature compensation in the context of strain gages? Explain the concept with an example. 7M
 b) Explain the bonding process of strain gages and materials used for bonding. 7M
6. a) Write dynamic equations which enable us to find the transfer function between the force "F" and the displacement " X_1 " shown in Figure 6(a). 7M



- b) Simplify the block diagram shown in Figure 6(b) and thus find the transfer function $Q_{out}/Q_{in}(s)$. 7M



7. a) The open loop transfer function of a unity feedback control system is given by

$$G(s) = \frac{20}{s(s+2)}$$

Find the state error to the input function $r(t) = 1 + t + t^2$.

7M

- b) Derive an expression for the peak overshoot of a second order under-damped system with the following transfer function, subjected to unit step.

$$G(s) = \frac{\omega_n^2}{s^2 + 2\xi\omega_n s + \omega_n^2}$$

7M

8. Factorize the polynomial $F(s) = s^6 + 2s^5 + 5s^4 + 6s^3 + 8s^2 + 4s + 4$ using Routh-Hurwitz Criterion and thus find all the roots of the equation $F(s) = 0$.

14M
