VI ME

USN | | | | | | | | | | |

06ME61

Sixth Semester B.E. Degree Examination, June 2012
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: *1. Answer FIVE full questions, selecting at least TWO from each part A and B.*
2. Use of data hand book permitted.
3. Missing data, if any, may be suitably assumed.

PART – A

1 a. Compare the stresses due to a bending moment applied on a straight beam and a curved beam. **(05 Marks)**

b. The parallel sides of a trapezoidal cross section of a crane hook of capacity 50 kN are 100 mm and 60 mm. the depth of the section being 120 mm. The radius of curvature of the inner fibre is 150 mm as shown is the Fig.Q1(b). Determine the stresses at the extreme fibres of the cross section of the crane hook. **(15 Marks)**

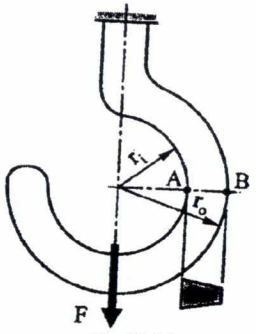


Fig.Q1(b)

2 a. In an air operated press, the piston rod of the operating cylinder must exert a force of 4000 N. The air pressure in the cylinder is 0.7 MPa. Calculate the bore of the cylinder, assuming that overall friction due to stuffing box and piston packing is equivalent to 8% of the maximum force exerted by the piston rod. Determine the thickness of the cylinder assuming that it is a seamless tubing with an allowable stress of 21 MPa. **(06 Marks)**

b. A steel hub 440 mm out side diameter, 250 mm inside diameter and 300 mm length has an interference fit with a shaft of 250 mm diameter. The torque to be transmitted is 30×10^4 N-m. The permissible stress for the material of the shaft and hub is 120 MPa. The coefficient of friction is 0.18. Determine:
i) The contact pressure
ii) Interference required
iii) The tangential stress at the inner and outer surface of the hub.
iv) Force required to assemble
v) Radial stress at the outer and inner diameter of the hub. **(14 Marks)**

3 a. Derive an expression for the stress induced is a helical spring, with usual notations. **(06 Marks)**

b. A carriage weighing 25000 N is moving on track with a linear velocity of 3.6 km/hour. If is brought to rest by two helical compression springs is the from of a bumper by under going a compression of 180 mm. The springs may be assumed to have a spring index of 6 and a permissible shear strength of 450 MPa. Design the spring and determine the diameter of the wire, mean coil diameter and the length of the spring. Assume the modulus of rigidity of the spring material as 81.4 GPa. **(14 Marks)**

4 a. Sketch and explain the different forms of involute gear tooth. **(05 Marks)**

b. A cast steel pinion with an allowable stress of 103 MPa rotating at 900 r/min is to drive a cast iron gear at 1440 r/min. The teeth are 20° stub involute and the maximum power to be transmitted is 25 kW. The allowable stress for cast iron gear is 56 MPa. Determine the module, number of teeth on the gears and face-width from the stand point of strength, dynamic load and wear. **(15 Marks)**

PART – B

5 a. Explain the advantages of worm drive. Write a note on materials used for worm and worm wheel. **(05 Marks)**

b. A speed reduced unit is to be designed for an input power of 0.75 kW with a transmission ratio of 27. The speed of the hardened worm is 1750 r/min. The worm wheel is made of phosphor bronze. The tooth form is to be $14\frac{1}{2}^\circ$ involute. The allowable stress for the wheel may be taken as 80 MPa. **(15 Marks)**

6 a. A multiplate clutch consists of five steel plates and four bronze plates. The inner and outer diameter of friction disks are 75 mm and 150 mm respectively. The coefficient of friction is 0.1 and the intensity of pressure is limited to 0.3 N/mm^2. Assuming uniform wear theory. Calculate:
i) The required operating force ii) Power transmitting capacity at 750 r/min. **(10 Marks)**

b. A differential band brake is shown is Fig.Q6(b). The width and thickness of the steel band are 100 mm and 3 mm respectively. The permissible tensile stress is the band is limited to 50 MPa. The coefficient of friction between the friction lining and the drum is 0.25. Calculate:
i) Tensions is the band ii) The actuating force iii) Torque capacity of the brake. **(10 Marks)**

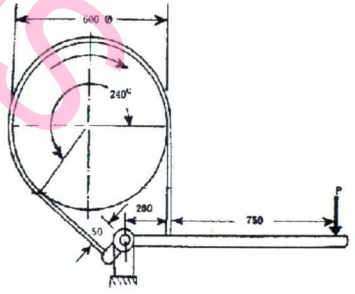


Fig.Q6(b)

7 a. Explain the properties a good bearing material should posses. List the different types of bearing materials. **(06 Marks)**

b. The following data are given for a full journal bearing:
Radial load: 25 kN
L/d ratio: 1:1
Unit bearing pressure: 2.5 MPa.
Viscosity of the lubricant: 20 Cp.
Class of fit: H7 e7.
Calculate:
i) Dimensions of the bearing
ii) Minimum oil film thickness.
iii) Requirement of oil flow.
Assume that the process to clearance is centered. **(14 Marks)**

8 a. Explain the advantages and applications of chain drives. **(05 Marks)**

b. The layout of the leather belt drive transmitting 15 kW power is shown in Fig.Q8(b). The centre distance between the pulleys is twice the diameter of the big pulley. The belt should operate at a velocity of 20 m/sec and the stresses in the belt should not exceed 2.25 MPa. The density of the leather belt is 0.95 g/cc and the coefficient of friction is 0.35. The thickness of the belt is 5 mm.
Calculate:
i) Diameter of the pulleys
ii) The length and width belts.
iii) Belt tensions.

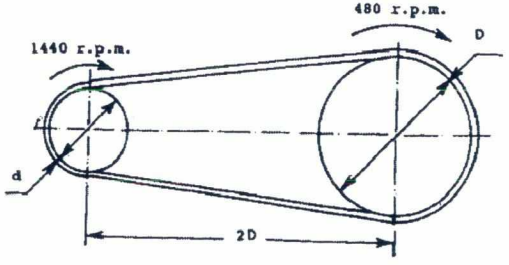


Fig.Q8(b)

(15 Marks)

* * * * *

USN | | | | | | | | | | |

06ME662

Sixth Semester B.E. Degree Examination, June 2012
Mechanics of Composite Materials

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Briefly describe the classification of composites. **(10 Marks)**

b. List and explain the properties and applications of : i) Glass fibers and ii) Carbon fibers. **(10 Marks)**

2 With suitable sketches, explain the following methods of manufacturing PMC's :

a. Hand lay – up b. Filament winding

c. Pultrusion d. Prepregs. **(20 Marks)**

3 a. List the characteristics of FRP's that are of significance for marine applications. **(05 Marks)**

b. Discuss the future potential of PMC's. **(05 Marks)**

c. Briefly explain the applications of PMC's in the following industries :

i) Electrical and electronics ii) Automobile. **(10 Marks)**

4 a. What is laminate? Describe in brief. **(05 Marks)**

b. A thermoplastic matrix contains 40 wt % glass fiber. If the density of the matrix ρ_m is 1.1gr/cc while that of glass fiber ρ_f is 2.5 gr/cc, what is the density of the composite? Assume that no voids are present and mass of composite = 100 gr. **(05 Marks)**

c. Write generalized Hooke's law in matrix form. Deduce the stiffness matrix and compliance matrix for a lamina from generalized Hooke's law. **(10 Marks)**

PART - B

5 a. What is lamination theory? Describe with a sketch of laminate stacking sequence code. **(10 Marks)**

b. Discuss the interlaminar stresses and edge effects in a laminate. **(10 Marks)**

6 a. Highlight the advantages and draw backs of MMCs over PMCs. **(06 Marks)**

b. Write a note on titanium matrix alloy used in MMCs. **(06 Marks)**

c. Briefly describe automotive applications of Aluminum matrix MMCs. **(08 Marks)**

7 With suitable sketches, briefly explain the following processing techniques used in MMCs :

a. Pressure infiltration technique.

b. Powder metallurgy technique. **(20 Marks)**

8 Discuss the effect of SiC particulate concentration (% volume fraction) on the following properties of Al – SiC MMC.

a. Strength.

b. Coefficient of thermal expansion.

c. Ductivity.

d. Modulus of elasticity. **(20 Marks)**

*****

USN | | | | | | | | | | |

06ME62

Sixth Semester B.E. Degree Examination, June 2012
Mechanical Vibrations

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Define the following terms:
   i) Resonance
   ii) Simple harmonic motion.
   iii) Time period. **(06 Marks)**

b. Add the following motions analytically:
$X_1 = 2\cos(wt + 0.5)$; $x_2 = 5\sin(wt + 1.0)$. **(04 Marks)**

c. Periodic motion in time domain is given by $x(t) = -20t + 2$ for $0 \le t \le 2$.
Obtain Fourier's series equation in frequency domain. **(10 Marks)**

2 a. A spring mass system has a stiffness of k N/m and a mass of M kg. It has natural frequency of vibration of 12 cps. An extra 2 kg mass is coupled to M and its net frequency becomes 10 cps. Find k and M. **(10 Marks)**

b. Determine the natural frequency of the system shown in Fig.Q2(b). The pulleys are mass-less and there is no slippage between pulley and rope.

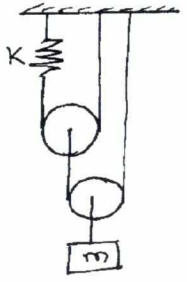


Fig.Q2(b) **(10 Marks)**

3 a. Define logarithmic decrement. Show that logarithmic decreement can be expressed as $\delta = \frac{1}{n}\log_e \frac{x_o}{x_n}$ (Derive the expression), where, x_o is amplitude at particular maximum and x_n is amplitude after 'n' cycles. **(10 Marks)**

b. A torsional pendulum has a natural frequency of 200 cpm when vibrating in vaccum (no damping). The mass moment of inertia of the disc is 2.5 kg cm^2. It is then immersed in oil and is observed that its damped natural frequency is 180 cpm. Determine the damping torque per radian per second. If the disc is displaced 3° when in oil, find its displacement at the end of first complete cycle. **(10 Marks)**

4 a. A mass of 100 kg is suspended on a spring having a stiffness of 19600 N/m and is acted upon by a harmonic force of 39.2 N at the undamped natural frequency. The damping coefficient is 98 N-s/m.
Determine:
   i) Undamped natural frequency
   ii) Amplitude of vibration of mass.
   iii) Phase difference between force and displacement. **(10 Marks)**

b. The springs of an automobile trailer are compressed 0.1 under its own weight. Find the critical speed when the automobile is traveling over a road with a profile approximated by a sine wave of amplitude 0.08 m and a wavelength of 14 m. What will be the amplitude of vibration at 60 Km/hr. **(10 Marks)**

PART – B

5 a. A commercial vibration pick-up has a natural frequency of 5.75 cps and a damping factor of 0.65. What is the lowest frequency beyond which the amplitude can be measured within ± 1% error? **(10 Marks)**

b. A rotor having a mass of 5 kg is mounted midway on a 1 cm diameter shaft supported at ends by bearings. Bearings span is 40 cm. Eccentricity is 0.02 mm. If the system rotates at 3000 rpm find the amplitude of steady state vibrations and dynamic force transmitted to bearings. $E = 1.96 \times 10^{11}$ N/m^2. Neglect damping. **(10 Marks)**

6 a. Determine the natural frequencies and mode shapes for a system shown in Fig.Q6(a). J_1 and J_2 are mass moment inertias of the discs. K_t is torsional stiffness of shaft. **(10 Marks)**

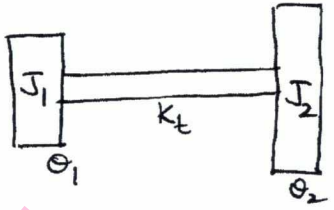


Fig.Q6(a)

b. A string is tightly stretched between two supports as shown in Fig.Q6(b). The tension T in the string may be assumed to be constant for small displacement. Obtain the two natural frequencies for the system.

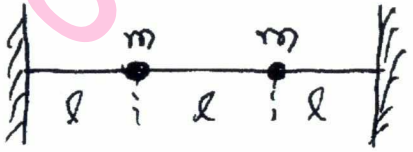


Fig.Q6(b) **(10 Marks)**

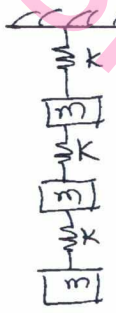
7 From the first principles show that the general solution for torsional vibration of circular shaft can be obtained as:

$$\theta = \sum_{i=1,2,3}^{\infty}\left(A_i \sin\frac{W_i x}{c} + B_i \cos\frac{W_i x}{c}\right)\left(C_i \sin W_i t + D_i \cos W_i t\right).$$

where, $C = \sqrt{\frac{G}{\rho}}$ = velocity of wave propagation G is modulus of rigidity and ρ is density.

(20 Marks)

8 a. Using stodola method find the fundamental natural frequency and mode shape of the system shown in Fig.Q8(a).



Assume k = 1 N/m
And m = 1kg.

Fig.Q8(a) **(10 Marks)**

b. Obtain influence coefficients for the system shown in Fig.Q8(b).

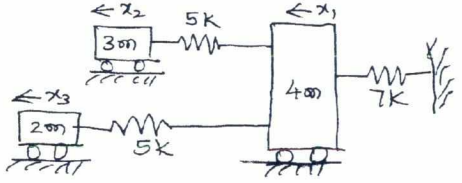


Fig.Q8(b) **(10 Marks)**

* * * * *

USN | | | | | | | | | | |

06ME63

Sixth Semester B.E. Degree Examination, June 2012
Modelling and Finite Element Analysis

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Differentiate between plane stress and plane strain problems. Also state the stress-strain relations for both. **(05 Marks)**

b. State the principle of minimum (stationary) potential energy and apply the same to determine nodal displacement of the spring system shown in Fig.Q1(b). **(10 Marks)**

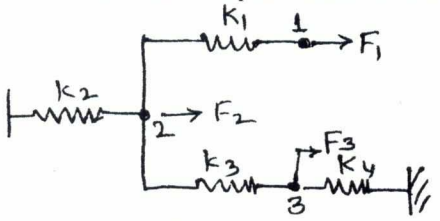


Fig.Q1(b)

$k_1 = 50$ N/mm
$k_2 = k_3 = 60$ N/mm
$k_4 = 80$ N/mm
$F_1 = 100$ N, $F_2 = 150$ N, $F_3 = 200$ N,

c. Evaluate the following integral using two point Gauss quadrature formula.

$$I = \int_1^3 \left(\frac{1}{x}\right) dx$$ **(05 Marks)**

2 a. What is FEM? What are the advantages and limitations of the method? **(08 Marks)**

b. Derive the element stiffness matrix of linear bar element and list the properties of stiffness matrix. **(12 Marks)**

3 a. What do you understand by C° and C^1 shape functions? State the properties of C° shape functions. Derive shape functions of a 3-noded bar element in natural coordinates. Show the variation of each shape function over the element. **(12 Marks)**

b. Discuss the various convergence criteria and geometric isotropy as regards to finite element models. **(08 Marks)**

4 a. What do you understand by Hermitian shape functions? Derive Hermite shape functions of a beam element and show the variation of the shape functions over the element. **(10 Marks)**

b. Explain the sub-super and isoparametric finite elements. **(05 Marks)**

c. Write a note on higher order elements used in FEM. **(05 Marks)**

PART – B

5 a. Derive a stiffness matrix for 2D truss element. **(10 Marks)**

b. Derive strain-displacement [B] matrix for a 3-noded CST element. **(10 Marks)**

6 a. Write a note on application of FEM in solving scalar field problems. **(04 Marks)**

b. Write the governing differential equations for one dimensional heat transfer and discuss the various types of boundary conditions used in solving heat transfer problems. **(06 Marks)**

c. Derive element conductivity matrix for one dimensional heat flow element. **(10 Marks)**

7 a. Determine the nodal displacement at node 2, the stresses in the elements at support reactions for the stepped bar shown in Fig.Q7(a). **(10 Marks)**

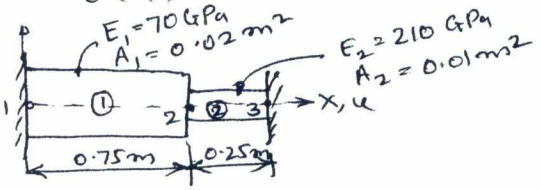


Fig.Q7(a)

b. For the truss element shown in Fig.Q7(b), (x, y) co-ordinates of the element are indicated near nodes 1, 2. The element displacement dof vector is given by $\{u\} = \lfloor 1.5 \;\; 1.0 \;\; 2.1 \;\; 4.3 \rfloor^T \times 10^{-2}$ mm. Take E = 300×10^3 N/mm^2, A = 100 mm^2, determine the following:

i) Element displacement dof in local coordinates (u_1^1 & u_2^1)

ii) Stress in the element

iii) Stiffness-matrix of the element. **(10 Marks)**

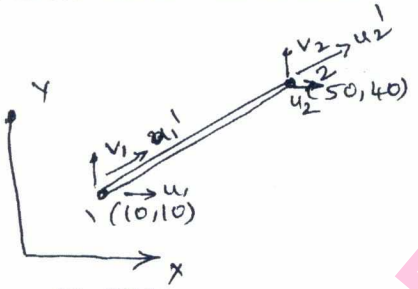


Fig.Q7(b)

$E = 300\times10^3$ N/mm^2

$A = 100$ mm^2

$$\begin{Bmatrix} u_1 \\ v_1 \\ u_2 \\ v_2 \end{Bmatrix} = \begin{Bmatrix} 1.5 \\ 1.0 \\ 2.1 \\ 4.3 \end{Bmatrix} \times 10^{-2} \text{ mm}$$

8 a. For the brick wall shown in Fig.Q8(a), the inner surface temperature is 28°C and outer surface is exposed to cold air at –15°C. Determine the temperature distribution in steady state, within the wall, by considering 2 elements, one dimensional heat flow elements. What is heat flux through the wall? **(10 Marks)**

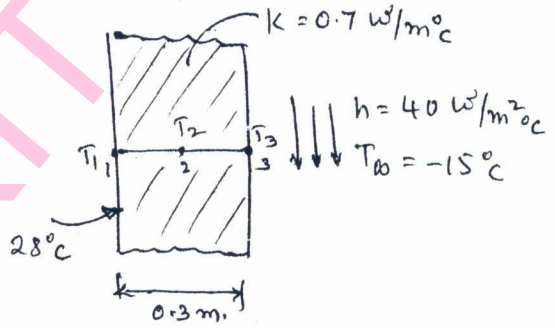


Fig.Q8(a)

b. For the beam fixed at both ends and loaded as shown in Fig.Q8(b), determine the displacement and slopes at node 2, and reaction force at node 1 only. **(10 Marks)**

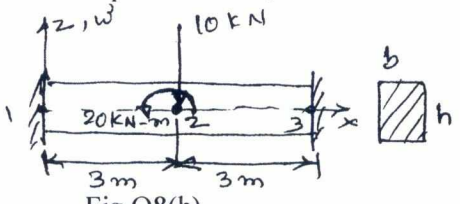


Fig.Q8(b)

E = 210 GPa
b = 0.2 m
h = 0.4 m

* * * * *

USN | | | | | | | | | | |

06ME64

Sixth Semester B.E. Degree Examination, June 2012
Mechatronics and Microprocessors

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Explain the meaning of the term "Mechatronics" with respect to multi-disciplinary scenario. Briefly discuss the origin and evolution of Mechatronics. **(07 Marks)**

b. Briefly explain the concept of system development in Mechatronics and functions of main elements in Mechatronics system (closed loop control system) with figure. **(07 Marks)**

c. What are micro-processor based controllers? Briefly explain the principle of working of any one of the following with figure: i) Automatic camera ii) Engine management system. **(06 Marks)**

2 a. What is a sensor and how are they classified? What are the different types of sensors? **(06 Marks)**

b. Briefly explain the various static and dynamic characteristics of sensors. **(06 Marks)**

c. Briefly explain the principle of working and applications of any two of the following sensors:
i) Light sensors ii) Pronimity sensors iii) Hall effect sensor **(08 Marks)**

3 a. Briefly explain the working principle of a stepper motor. Draw the T-θ characteristic curve of a 3ϕ variable – reluctance (VR) type of a stepper motor and then predict stable and unstable position of the rotor. **(10 Marks)**

b. Explain the basic construction of DC motors. Explain field and armature speed control of DC motors. **(10 Marks)**

4 a. Draw the circuit diagram of op-amp integrator, differentiator and derive an expression of an output voltage. **(06 Marks)**

b. Explain balance mode of wheat stone bridge and hence deduce the expression for change in output voltage. **(08 Marks)**

c. With bock diagram, explain digital data acquisition system. **(06 Marks)**

PART – B

5 a. Implement a NOT, OR and AND gates using NOR gates. Also mention their truth tables. **(08 Marks)**

b. Convert the following: i) $(754.534)_{10} = (\_\_\_\_\_)_{16}$ ii) $(110.10101)_2 = (\_\_\_\_\_)_{10}$
iii) $(327.45)_8 = (\_\_\_\_\_)_{10}$ **(06 Marks)**

c. State Demorgan's theorems. Also draw the logic circuits for the same. **(06 Marks)**

6 a. Explain the following terminologies of a 8085 microprocessor:
i) Program counter ii) Assembler iii) ALU iv) Fetch cycle
v) BUS **(10 Marks)**

b. State any five differences between a microprocessor and a microcontroller. **(05 Marks)**

c. Give the classification of microcontrollers. **(05 Marks)**

7 a. Explain the architecture of 8085 microprocessor with neat block diagram. **(10 Marks)**

b. Write a program to find the largest of a byte in the array of numbers. **(10 Marks)**

8 a. Explain the flow of instruction and data in the 8085 microprocessor. **(07 Marks)**

b. Draw and explain the timing diagram of opcode fetch machine cycle. **(10 Marks)**

c. List the differences of 4004 and 8085 microprocessors register organization. **(03 Marks)**

* * * * *

USN | | | | | | | | | | |

06ME65

Sixth Semester B.E. Degree Examination, June 2012
Heat and Mass Transfer

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer FIVE full questions, selecting at least TWO questions from each part.***
2. Use of heat transfer data handbook is permitted.

PART – A

1 a. What do you mean by boundary condition of 1st, 2nd and 3rd kind? **(06 Marks)**

b. Derive general heat conduction equation in cartesion co-ordinates. **(08 Marks)**

c. A 0.8 m high and 1.5 m wide double plane window consists of two 4 mm thick layers of glass (k = 78 W/m°C), separated by a 10 mm wide stagnant air space (k = 0.026 W/m°C). Determine the rate of heat transfer through this window and the temperature of the inside surface, when the room is maintained at 20 °C and the outside air is at –10 °C. Take the convention heat transfer co-efficients on the inside and outside surfaces of the window as 10 and 40 W/m°C respectively. **(06 Marks)**

2 a. What is physical significance of critical thickness of insulation? Derive an expression for critical thickness of insulation for a cylinder. **(06 Marks)**

b. Derive an expression for temperature distribution for a pin fin with the tip insulated. **(08 Marks)**

c. A carbon steel (k = 54 W/ m°C) rod with a cross section of an equilateral triangle (each side 5 mm) is 80 mm long. It is attached to a plane wall which is maintained at a temperature of 400 °C. The surrounding environment is at a 50 °C and unit surface conductance is 90 W/ m°C. Compute the heat dissipated by the rod (assuming tip is insulated). **(06 Marks)**

3 a. What are Biot and Fourier numbers? Explain their physical significance. **(06 Marks)**

b. Obtain an expression for instantaneous heat transfer and total heat transfer for lumped heat analysis treatment heat conduction problems. **(08 Marks)**

c. A solid copper sphere of 10 cms dia [density 8954 kg/m^3, specific heat 383 J/kg °C, thermal conductivity 386 W/ °C] initially at a uniform temp t_i = 250 °C is suddenly immersed in a well stirred fluid which is maintained at a uniform temperature t_a = 50°C, the heat transfer co-efficient between the sphere and the fluid is 200 W/m^2°C. Determine the temperature of the copper block at 5 minutes after the immersion. **(06 Marks)**

4 a. With reference to fluid flow over a flat plate, discuss the concepts of velocity boundary layer and thermal boundary layer, with necessary sketches. **(06 Marks)**

b. Air at 27 °C and at atmospheric pressure flows over a flat plate at a speed of 2 m/sec. If the plate is maintained at 93 °C, calculate the heat transfer per unit width of the plate, assuming the length of the plate along the flow of air is 2 metres. **(08 Marks)**

c. A steam pipe 5 cms diameter is lagged with insulating material of 2.5 cm thick. The surface temperature is 80 °C and emissivity of the insulating material surface is 0.93. Find the total heat loss from 10 metre length of pipe considering the heat loss by natural convection and radiation. The temperature of the air surrounding the pipe is 20 °C. Also find the overall heat transfer co-efficient and heat transfer co-efficient of radiation. **(06 Marks)**

PART – B

5 a. With the help of dimensional analysis, derive expression for the Reynolds number, Prandtl number and Nusselt number. **(10 Marks)**

b. A surface condenser consists of two hundred thin walled circular tubes (each tube is 22.5 mm diameter and 5 m long) arranged in parallel, through which water flows. If the mass flow rate of water through the tube bank is 160 kg/sec and its inlet and outlet temp are known to be 21°C and 29°C respectively, calculate the average heat transfer co-efficient associated with flow of water. **(10 Marks)**

6 a. Derive an expression for LMTD for a counter flow heat exchanger. **(10 Marks)**

b. The velocity of water flowing through a tube of 2.2 cms diameter is 2 m/sec. Steam condensing at 150 °C on the outside surface of the tube heats the water from 15 °C to 60 °C over the length of the tube. Find the heat transfer co-efficient and the length of the tube neglecting the tube and steam side film resistance. **(10 Marks)**

7 a. Clearly explain the regions of pool boiling with neat sketch. **(06 Marks)**

b. State Fick's law of diffusion. What are its limitations? **(06 Marks)**

c. A vertical square plate (30 cms × 30 cms) is exposed to steam at atmospheric pressure. The plate temp is maintained at 98°C. Calculate the heat transfer rate and mass of steam condensed per hour. Take the properties of water film at mean temperature.
Density = 960 kg/m^3
Dynamics viscosity = 282 × 10^{-6} kg/m.s
Thermal conductivity = 0.61 W/m°C
Latent heat = 2255 kJ/kg
Temp of the steam = 100 °C. **(08 Marks)**

8 a. Define the following:
i) Black body
ii) Kirchoff's law
iii) Stefan boltzman law.
iv) Wein's displacement law.
v) Plank' law. **(10 Marks)**

b. Two large parallel planes having emissivities at 0.3 and 0.5 are maintained at temperature of 800 °C and 300 °C respectively. A radiation shield having an emissivity of 0.05 on both sides is placed between the two planes.
Calculate:
i) Heat transfer per unit area without shield.
ii) Find the temperature of the shield and heat transfer per unit area with shield. **(10 Marks)**

* * * * *

USN | | | | | | | | | | |

06ME665

Sixth Semester B.E. Degree Examination, June 2012

Non-Traditional Machining

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Give the broad classification of non-traditional machining processes. **(06 Marks)**
b. What are the advantages of non-traditional machining processes? **(06 Marks)**
c. With a neat sketch, explain the working principle of ultrasonic machining process. **(08 Marks)**

2 a. Explain the effect of different process parameters on machining performance in USM process. **(10 Marks)**
b. What are the advantages, disadvantages and applications of USM process? **(10 Marks)**

3 a. Sketch and explain AJM process. **(10 Marks)**
b. During AJM process the mixing ratio is 0.2. Calculate the mass ratio if the ratio of density of abrasive and density of carrier gas is 20. **(04 Marks)**
c. What are the process variables that affect the performance of water-jet machining process. **(06 Marks)**

4 a. With a neat sketch, explain the working principle of ECM process. **(08 Marks)**
b. Sketch and explain different types of tools used in ECM process. **(06 Marks)**
c. List the advantages, limitations and applications of ECM process. **(06 Marks)**

PART – B

5 a. What are Maskants used in chemical machining? Explain the different types of it. **(10 Marks)**
b. What are the factors to be considered in the selection of etchant? **(04 Marks)**
c. List the commonly used dielectric fluids in EDM process. What properties should they posses? **(06 Marks)**

6 a. Derive the relationship for breakdown voltage, V_b in EDM process, ($V_b \approx 0.72\ V_o$), where V_o is the supply voltage. **(12 Marks)**
b. Sketch and explain ECG process. **(08 Marks)**

7 a. Sketch and explain transferred and non-transferred plasma arc system. **(10 Marks)**
b. Write a note on process performance in plasma arc cutting process. **(04 Marks)**
c. Write a note on different types of lasers used in LBM process. **(06 Marks)**

8 a. What are the advantages and applications of laser beam machining? **(08 Marks)**
b. Sketch and explain electro beam machining process. **(08 Marks)**
c. What are the process parameters affect on the machining process in EBM? **(04 Marks)**

* * * * *

USN | | | | | | | | | | |

06ME666

Sixth Semester B.E. Degree Examination, December 2011
Statistical Quality Control

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Use of SQC tables is permitted.

PART – A

1 a. State and explain SQC. Discuss the major benefits of SQC. **(08 Marks)**

b. Briefly explain the quality costs and state their inter– relationship using a suitable graph. **(12 Marks)**

2 a. Discuss standard normal deviation using the normal distribution table and the normal curve. **(04 Marks)**

b. Find the area under the normal curve between
i) $\mu - \sigma$ to $\mu + \sigma$
ii) $\mu - 2\sigma$ to $\mu + 2\sigma$
iii) $\mu - 3\sigma$ to $\mu + 3\sigma$. **(10 Marks)**

c. Explain clearly central limit theorem. **(06 Marks)**

3 a. Distribution between chance causes and assignable causes. **(06 Marks)**

b. Discuss clearly the statistical basis for the control charts and mention uses of control charts. **(08 Marks)**

c. Explain the following :
i) Warning limits
ii) Average run length (ARL). **(06 Marks)**

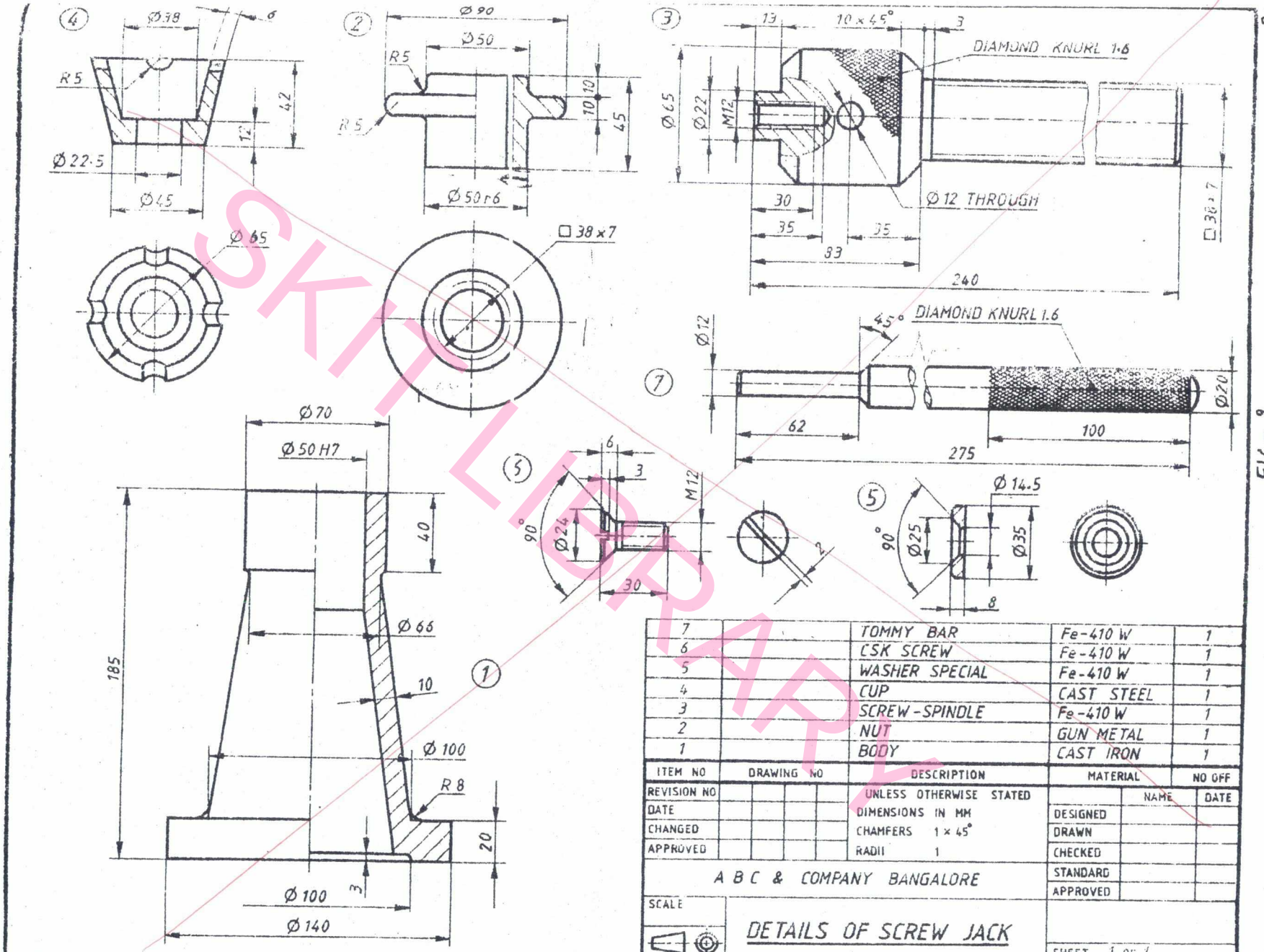
4 a. Clearly differentiate between TYPE I and TYPE II errors. **(08 Marks)**

b. Control charts for $\overline{X}$ and R are maintained on a certain quality characteristic. A subgroup size of 5 is selected. For 25 sub groups, $\Sigma \overline{X} = 514.8$ and $\Sigma R = 120$. Compute the values of 3σ limits for the $\overline{X}$ and the R charts and estimate the value of σ^1 on the assumption that the process is in statistical control. **(12 Marks)**

PART – B

5 a. State and discuss the importance of process capability. **(04 Marks)**

b. Subgroups of 5 items each from a manufacturing process are taken. A certain quality characteristic is measured. $\overline{X}$ and R values are computed for each sub group. After 25 subgroups, $\Sigma \overline{X} = 357.50$ and $\Sigma R = 8.8$. Compute the control chart limits. All points on both charts fall within these limits. If the specification limits are 14.40 ± 0.40, what conclusions can you draw about the ability of the existing process? Suggest the possible ways in which the sitnation could be controlled. **(16 Marks)**



7		TOMMY BAR	Fe-410 W	1
6		CSK SCREW	Fe-410 W	1
5		WASHER SPECIAL	Fe-410 W	1
4		CUP	CAST STEEL	1
3		SCREW-SPINDLE	Fe-410 W	1
2		NUT	GUN METAL	1
1		BODY	CAST IRON	1
ITEM NO	DRAWING NO	DESCRIPTION	MATERIAL	NO OFF

REVISION NO		UNLESS OTHERWISE STATED		NAME / DATE
DATE		DIMENSIONS IN MM	DESIGNED	
CHANGED		CHAMFERS 1 × 45°	DRAWN	
APPROVED		RADII 1	CHECKED	
A B C & COMPANY BANGALORE			STANDARD	
			APPROVED	

SCALE

DETAILS OF SCREW JACK

SHEET 1 OF 1

Fig-2

6 a. Distinguish between a P–chart and a C–chart and comment on their usability. **(06 Marks)**

b. The table below shows the number of defects per lot in 15 successive lots of 5 electronic calculators. Plot the control chart based on this data. In case, the reasons for out of control points are known and can be eliminated, what upper control limit should be suggested for the future production? **(14 Marks)**

Lot no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
No. of defects	3	2	1	2	6	1	3	2	0	0	0	0	0	1	2

Table Q 6(b)

7 a. Briefly explain double sampling plan using a flow chart. **(05 Marks)**

b. Construct the OC curve for a single sampling plan, n = 300 and c = 5. Find AQL and LTPD when α = 5% and β = 10%. Also calculate AOQ values and indicate AOQL, with suitable diagram. **(15 Marks)**

8 a. Discuss the basic principles of the 'cusum' control chart for maintaining the process mean. **(10 Marks)**

b. Explain an 'EWMA control chart' for monitoring the process mean. **(10 Marks)**

* * * * *

iii) The value of switch expression must be of type _____
A) Real B) int C) double D) All of these
iv) The least number of times the do – while loop will be executed is ____
A) 0 B) 1 C) 2 D) Both A and B

b. Distinguish between while and do-while statement. **(08 Marks)**

c. Write a C program to read a positive number and reverse the given number. **(08 Marks)**

7. a. Select the correct answer : **(04 Marks)**

i) Number of elements in an array defined by a [3] [4] is
A) 8 B) 12 C) 16 D) None of these
ii) If χ[4] is a declaration, then the first and last array index will be
A) 1, 4 B) 0, 3 C) 3, 0 D) None of these
iii) Given int a [3] [2] = {1, 2, 3, 4, 5, 6} ; the element in the 3rd row and 2nd column is _____
A) 3 B) 6 C) 52 D) 4
iv) A function that is used to join two strings is _____
A) Strepy B) Strlen C) Streat D) Stremp

b. Explain the declaration and initialization of one dimensional array with examples. **(06 Marks)**

c. Write a C program to input N integers into a single dimensional array and sort them in descending order using bubble sort method. Print both given array and sorted array with suitable headings. **(10 Marks)**

8. a. Select the correct answer : **(04 Marks)**

i) _____ execution of instructions in a computer system is referred to as parallel computing.
A) Serial B) Sequential C) Accurate D) Simultaneous
ii) Which of the following can be used as a resource in parallel computing?
A) A single computer with multiple processors.
B) An arbitrary number of computers connected by a network.
C) A combination of the above.
D) All of these.
iii) Open Mp stands for ____
A) Open multi – parallelism B) Organised multi – programming
C) Open multi – processing D) Organised multi – parallelism.
iv) An example of environment variable in OPEN MP is
A) Omp – thread – limit B) Omp – init – lock
C) Omp – test – lock D) Omp – get – dynamic.

b. Define concurrent processing. What is the motivation for concurrent processing? **(10 Marks)**

c. What are threads? Give the advantages and disadvantages of multiple threads. **(06 Marks)**

*****