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06ME61

Sixth Semester B.E. Degree Examination, December 2011
Design of Machine Elements – II

Time: 3 hrs. Max. Marks:100

Note: *1. Answer any FIVE full questions, selecting atleast TWO questions from each part.*
2. Use of machine data hand book is permitted.

PART – A

1 a. Give the differences between a straight beam and curved beam. **(04 Marks)**

b. The cross section of a steel crane hook is a trapezium with an inner side of 50 mm and outer side of 25 mm. The depth of the section is 64 mm. The centre of curvature of the section is at a distance of 64 mm from the inner edge of the section and the line of action of load is 50 mm from the same edge. Determine the maximum load the hook can carry if the allowable strength is limited to 60 MPa. **(16 Marks)**

2 a. Design a helical compression spring to sustain an axial load that fluctuates between 1.5 kN and 2 kN with an associated deflection of 15 mm during the fluctuation of load. **(10 Marks)**

b. An automotive leaf spring is to be designed to consist of 10 graduated leaves and 2 full length leaves. The spring is to support a central load of 5 kN over a span of 1100 mm with the actual band with of 100 mm. The width and thickness of leaves limiting the maximum equalized stress induced in the leaves to 350 MPa. Also determine the initial gap to be provided between the full length and graduated leaves before the assembly. **(10 Marks)**

3 a. Derive Lame's equation for thick cylinder. **(10 Marks)**

b. A circular plate made of steel and of diameter 200 mm with thickness 10 mm is subjected to a load inducing a pressure of 4 MPa. Taking E = 201 kN /mm^2, Poisson's ratio = 0.3, determine :

i) The maximum stress, its location and maximum deflection when the edges of the plate are supported

ii) The maximum stress, its location and maximum deflection when the edge of the plate is fixed. **(10 Marks)**

4 a. Derive the Lewis equation for the beam strength of a gear tooth. Also list the assumptions. **(04 Marks)**

b. Design a pair of spur gears to transmit 20 kW of power at a pinion speed of 1000 rpm. The required velocity ratio is 3.5 : 1. 20° stub involutes tooth profile to be used. The static design stress for the pinion is 100 MPa and for the gear is 70 MPa. The pinion has 16 teeth. Determine the module, face width, and pitch circle diameters of the gears based on a service factor is 1.25. **(16 Marks)**

PART – B

5 a. Explain with a sketch, the formulative number of teeth based on bevel gears. **(04 Marks)**

b. A pump is driven by a 30 kW motor through a pair of right angled bevel gear. The speed of the motor is 1200 rpm. The pinion on the motor has a pitch circle diameter of 150 mm and carries 30 teeth and the gear on the pump shaft carries 40 teeth. The pinion made of C_{45} steel untreated where as the gear is made of 0.2 % carbon steel untreated. The teeth are generated to have 20° full depth involute. Check whether the gear pair is safe from the stand point of bending strength. **(16 Marks)**

6 a. A multiple clutch as steel on bronze is to transmit 8 kW at 1440 rpm. The inner diameter of the contact is 80 mm and the outer dia of contact is 140 mm. The clutch operates in oil with expected co–efficient of friction of 0.1, the average allowable pressure is 0.35 MPa. Assume uniform wear theory and determine the following :

i) No. of steel and bronze plates
ii) Axial force required
iii) Actual maximum pressure. **(10 Marks)**

b. A friction cone clutch has to transmit a torque of 200 N/m at 1440 rpm. The large diameter of the cone is 350 mm, the cone pitch angle is 6.25°. The face width is 65 mm. The co–efficient of friction is 0.2. Determine :

i) The axial force required to transmit the torque
ii) The average normal pressure on the contact surface with the maximum torque is transmitted. **(10 Marks)**

7 a. Discuss the mechanism of fluid film lubrication. **(04 Marks)**

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 70°C and ambient temperature is 30°C. Check the design for thermal equilibrium and also determine the power loss at the bearing. The lubricant used is of grade SAE 40 $\ell/d = 1.5$. **(16 Marks)**

8 a. Select a V belt drive to transmit a power of 6 kW from a shaft rotating at 1500 rpm to a parallel shaft to be run at 375 rpm. The distance between the shaft centres is 500 mm. The pitch dia of the smaller grooved pulley car be taken to be 150 mm. The factor of application is to be taken as 1.2. **(10 Marks)**

b. Select a standard v–belt to transmit 30 kW from an AC induction motor rotating at 1500 rpm to a centrifugal pump rotating at 750 rpm. The drive operates continuously for 8 hr /day. Calculate the number of belts. **(10 Marks)**

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06ME62

Sixth Semester B.E. Degree Examination, December 2011
Mechanical Vibrations

Time: 3 hrs. Max. Marks:100

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

PART - A

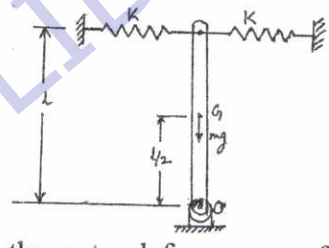
1 a. Split the harmonic motion $x = 10 \sin (wt + \pi/6)$, into two harmonic motions one having a phase angle of zero and the other of 45^0.Use both analytical and graphical methods. **(10 Marks)**

b. An unknown weight W, added to an unknown spring K has a natural frequency 95 cycles/min. When 5N is added to W, the natural frequency is lowered to 75 cycles/min. Determine the unknown weight and the spring constant. **(04 Marks)**

c. The ratio K/m of a spring - mass system is given as 4.0. If the mass is deflected 2cm down measured from the equilibrium position and given an upward velocity of 8cm/s, determine its amplitude and maximum acceleration. **(06 Marks)**

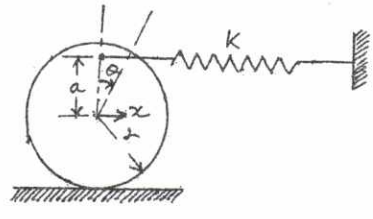
2 a. A uniform rigid bar is pivoted at one end and connected symmetrically by two springs at the other end as shown in fig.Q2(a). Assume that the mass of the bar is m and that the springs are unstretched when the bar is vertical. Determine the natural frequency of oscillation of the bar for small displacements. Is there any limitations on the value of K? Discuss. **(10 Marks)**

Fig.Q2(a)



b. Use the energy method to find the natural frequency of oscillation of the homogeneous cylinder shown in fig.Q2(b). **(10 Marks)**

Fig.Q2(b)



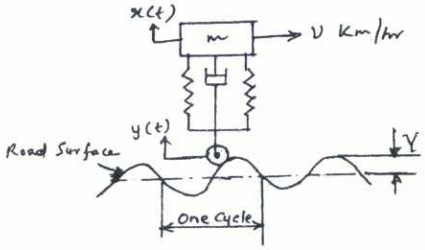
3 a. Derive an expression for the oscillatory motion of a spring–mass–damper system. **(10 Marks)**

b. The ratio of successive amplitudes of a viscously damped single degree of freedom system is found to be 18:1. Determine the ratio of successive amplitudes if the amount of damping is halved. **(06 Marks)**

c. Define the terms : i) Damping factor ii) Logarithmic decrement. **(04 Marks)**

4 a. Figure Q4(a) shows a simple model of a motor vehicle that can vibrate in the vertical direction, while traveling over a rough road. The vehicle has a mass of 1200 kg. The suspension system has a spring constant of 400kN/m and a damping factor of $\xi = 0.5$. If the vehicle speed is 20km/hr, determine the displacement amplitude of the vehicle. The road surface varies sinusoidally with an amplitude of Y = 0.05m and a wave length of 6m. **(10 Marks)**

Fig.Q4(a)



b. A centrifugal fan weighs 450N and has a rotating unbalance of 2.25 N-m. when dampers having damping factor $\xi = 0.2$ are used, specify the springs for mounting, such that, only 10% of the unbalanced force is transmitted to the floor. Also, determine the magnitude of the transmitted force. The fan is running at constant speed of 1000 rpm. **(10 Marks)**

PART - B

5 a. Write a brief note on : i) Seismic instrument ii) Critical speed of shaft. **(06 Marks)**

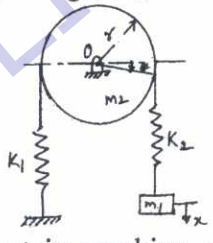
b. A vibrometer, whose damping is negligible, is employed to find the magnitude of vibration of a machine structure. It gives a reading of the relative displacement of 0.05mm. The natural frequency of the vibrometer is given as 300 cpm and the machine is running at 100 rpm. What will be the magnitude of displacement, velocity and acceleration of the vibrating machine part? **(07 Marks)**

c. A shaft, carrying a rotor of weight 450N and eccentricity 2.54mm rotates at 1200 rpm. Determine i) the steady state whirl amplitude and ii) the maximum whirl amplitude during start up conditions of the system. Assume the stiffness of the shaft as 36000N/m and the external damping ratio as 0.1. **(07 Marks)**

6 a. Find the natural frequencies of the system shown in fig.Q6(a). Assume that there is no slip between the cord and the cylinder. **(10 Marks)**

$K_1 = 40$ N/m , $K_2 = 60$N/m , $m_1 = 2$kg , $m_2 = 10$kg.

Fig.Q6(a)



b. A section of pipe pertaining to a certain machine, vibrates with a large amplitude at a compressor speed of 220 rpm. For analyzing this system, a spring – mass system was suspended from the pipe to act as an absorber. A 1 kg absorber mass tuned to 220 cpm resulted in two resonant frequencies of 188 and 258 cpm. What must be the mass and the spring stiffness of the absorber if the resonant frequencies are to be outside the range of 150 to 310 cpm? **(10 Marks)**

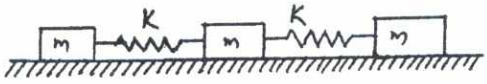
7 a. Derive the differential equation of motion for the lateral vibrations of beams. Obtain the general solution to the differential equations. **(16 Marks)**

b. State the boundary conditions for determining the normal function in beams with different end fixity conditions. **(04 Marks)**

8 a. A shaft of negligible weight 6cm in diameter and 5m long is simply supported at the ends and carries four weights of 50kg each, at equal distances over the length of the shaft. Find the frequency of vibration by Dunkerley's method. Take $E = 2 \times 10^{11}$ N/m^2. **(10 Marks)**

b. Use Holzer's method to determine the natural frequencies of the spring – mass system shown in fig. Q8(b) . **(10 Marks)**

Fig.Q8(b)



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06ME63

Sixth Semester B.E. Degree Examination, December 2011
Modelling and Finite Element Analysis

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Write the equilibrium equation for 3-D state of stress and state the terms involved. **(04 Marks)**

b. Solve the following system of equations by Gaussian elimination method :

$x_1 + x_2 + x_3 = 6$

$x_1 - x_2 + 2x_3 = 5$

$x_1 + 2x_2 - x_3 = 2.$ **(08 Marks)**

c. Determine the displacements of holes of the spring system shown in the figure using principle of minimum potential energy. **(08 Marks)**

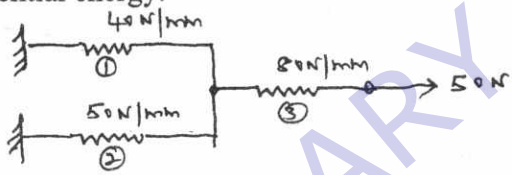


Fig.Q.1(c).

2 a. Explain the discretization process of a given domain based on element shapes number and size. **(06 Marks)**

b. Explain basic steps involved in FEM with the help of an example involving a structural member subjected to axial loads. **(08 Marks)**

c. Why FEA is widely accepted in engineering? List various applications of FEA in engineering. **(06 Marks)**

3 a. Derive interpolation model for 2-D simplex element in global co – ordinate system. **(10 Marks)**

b. What is an interpolation function? Write the interpolation functions for :

i) 1 – D linear element ; ii) 1 – D quadratic element.

iii) 2 – D linear element ; iv) 2 – D quadratic element.

v) 3 – D linear element. **(06 Marks)**

c. Explain "complete" and "conforming" elements. **(04 Marks)**

4 a. Derive shape function for 1 – D quadratic bar element in neutral co-ordinate system. **(08 Marks)**

b. Derive shape functions for CST element in NCS. **(08 Marks)**

c. What are shape functions and write their properties. (any two). **(04 Marks)**

PART – B

5 a. Derive the body force load vector for 1 – D linear bar element. **(04 Marks)**

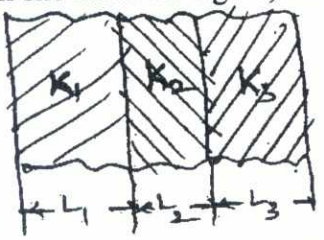
b. Derive the Jacobian matrix for CST element starting from shape function. **(06 Marks)**

c. Derive stiffness matrix for a beam element starting from shape function. **(10 Marks)**

6 a. Explain the various boundary conditions in steady state heat transfer problems with simple sketches. **(06 Marks)**

b. Derive stiffness matrix for 1 – D heat conduction problem using either functional approach or Galerkin's approach. **(08 Marks)**

c. For the composite wall shown in the figure, derive the global stiffness matrix. **(06 Marks)**

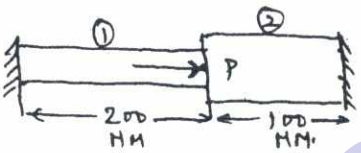


Take
$A_1 = A_2 = A_3 = A$

Fig.Q.6(c)

7 a. The structured member shown in figure consists of two bars. An axial load of P = 200 kN is loaded as shown. Determine the following :

i) Element stiffness matricies.
ii) Global stiffness matrix.
iii) Global load vector.
iv) Nodal displacements.



i) Steel $A_1 = 1000\ mm^2$
$E_1 = 200\ GPa$
ii) Bronze $A_2 = 2000\ mm^2$
$E_2 = 83\ GPa$. **(08 Marks)**

b. For the truss system shown, determine the nodal displacements. Assume E = 210 GPa and A = 600 mm^2 for both elements. **(12 Marks)**

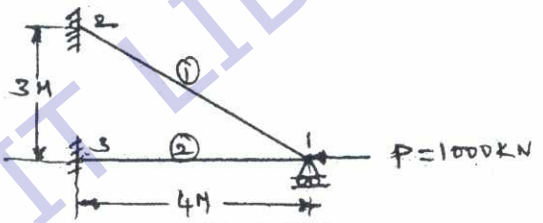


Fig.Q.7(b)

8 a. Determine the temperature distribution in 1 – D rectangular cross – section fin as shown in figure. Assume that convection heat loss occurs from the end of the fin. Take $k = \frac{3w}{Cm^{\circ}C}$, $h = \frac{0.1w}{Cm^{2^{\circ}}C}$, $T_{\infty} = 20^{\circ}C$. Consider two elements **(10 Marks)**

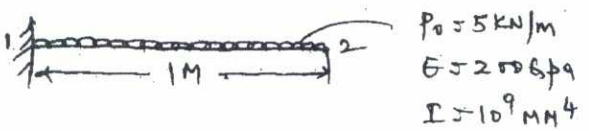


Fig.Q.8(a)

b. For the cantilever beam subjected to UDL as shown in Fig.Q.8(b), determine the deflections of the free end. Consider one element. **(10 Marks)**

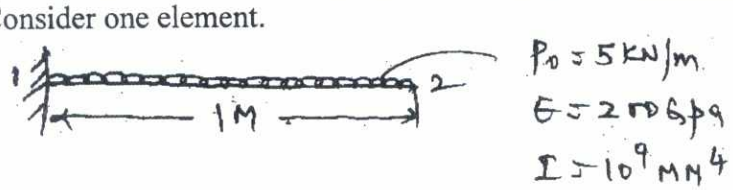


Fig.Q.8(b)

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06ME64

Sixth Semester B.E. Degree Examination, December 2011
Mechatronics & Microprocessor

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define Mechatronics. Briefly explain various evolution stages of Mechatronics. **(10 Marks)**

b. Explain with a block diagram the working of a microprocessor controlled washing machine. **(10 Marks)**

2 a. Define transducer. Explain primary and secondary transducers with examples. **(10 Marks)**

b. What is Hall effect? Explain the principle of Hall effect with a neat sketch. **(10 Marks)**

3 a. Name any four important solid state switches and explain each in brief. **(10 Marks)**

b. Explain non-permanent magnet type DC motors with schematic diagrams. **(10 Marks)**

4 a. Explain inverting and non-inverting op-amps with a neat sketch. **(10 Marks)**

b. How are filters classified? Explain low pass and high pass filters. **(10 Marks)**

PART – B

5 a. Explain the evolution of microprocessor and explain with a block diagram the organization of microprocessor. **(10 Marks)**

b. What are logic gates? Explain AND, OR and NOT gates with symbols and truth tables. **(10 Marks)**

6 a. Explain 8085 A microprocessor architecture with a block diagram. **(10 Marks)**

b. Explain the following technology related to microprocessor:

i) RAM ii) ALU iii) Address Bus iv) Interrupts v) Microcontroller. **(10 Marks)**

7 a. What are the types of registers used in 8085 microprocessor? Explain with a block diagram. **(10 Marks)**

b. Explain pin configuration of 8085 microprocessor with a schematic diagram. **(10 Marks)**

8 a. Explain the instructions and data flow with reference to a microprocessor. **(10 Marks)**

b. Explain the system clock and memory access. **(10 Marks)**

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06ME65

Sixth Semester B.E. Degree Examination, December 2011
Heat and Mass Transfer

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain briefly: i) Thermal conductivity ii) Thermal diffusivity iii) Overall heat transfer co-efficient. **(06 Marks)**

b. Derive the general three dimensional conduction equation in Cartesian co-ordinates and state the assumptions made. **(08 Marks)**

c. A square plate heater of size 20 cms × 20 cms is inserted between two slabs. Slab 'A' is 3 cms thick (K = 50 W/mK) and slab 'B' is 1.5 cms (K = 0.2 W/mK). The outside heat transfer co-efficients on both sides of A and B are 200 and 50 W/m^2K respectively. Temperature of surrounding air is 25°C. If the rating of the heater is 1 kW, find
i) Maximum temperature in the system. ii) Outer surface temperature of two slabs.
Draw the equivalent circuit for the system. **(06 Marks)**

2 a. Derive an expression for the temperature distribution for a long pin of uniform cross section without insulated tip. **(10 Marks)**

b. A rod (K = 200 W/mK) 10 mm in diameter and 5 cms long has its one end maintained at 100°C. The surface of the rod is exposed to ambient air at 30°C with convective heat transfer co-efficient of 100 W/m^2K. Assuming other end insulated, determine
i) The temperature of the rod at 25 mm distance from the end at 100°C.
ii) Heat dissipation rate from the surface of the rod and
iii) Effectiveness. **(10 Marks)**

3 a. Explain physical significance of Biot number and Fourier number. **(04 Marks)**

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

c. A 15 mm diameter mild steel sphere K = 42 W/m°C is exposed to cooling air flow at 20°C resulting in the convective co-efficient h = 120 W/m^2°C.
Determine the following:
i) Time required to cool the sphere from 550°C to 90°C.
ii) Instantaneous heat transfer rate 2 minutes after the start of cooling. For mild steel
$\rho = 7850\ kg/m^3$; $C_p = 475\ J/kg°C$; $\alpha = 0.045\ m^2/hr$ **(08 Marks)**

4 a. What do you mean by hydrodynamic and thermal boundary layer? **(04 Marks)**

b. Explain physical significance of,
i) Grashoff number ii) Prandtl number iii) Nusselt number
iv) Reynolds number **(08 Marks)**

c. A nuclear reactor with its core constructed of parallel vertical plates 2.2 m high and 1.4 m wide has been designed on free convection heating of liquid bismuth. The maximum temperature of the plate surface is limited to 960°C while the lowest allowable temperature of bismuth is 340°C. Calculate the maximum possible heat dissipation from both sides of each plate. For the convective co-efficient the appropriate correlation is $N_u = 0.13(Gr.Pr)^{0.333}$. **(08 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

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

b. Air at standard conditions of 760 mm of Hg at 20°C flows over a flat plate at 3 m/sec. The plate is 50 cms × 25 cms. Find the heat lost per hour if air flow is parallel to 50 cms side of the plate. If 25 cms side is kept parallel to the air flow, what will be the effect on heat transfer? Temperature of the plate is 100°C. **(10 Marks)**

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

b. An oil cooler consists of straight tube of 2 cms OD and 1.5 cm ID enclosed with in a pipe and co-centric with it. The external pipe is well insulated. The oil flows through the tube at 0.05 kg/sec (Cp = 2 KJ/kg°C) and cooling fluid flows in the annulus in opposite direction at the rate of 0.1 kg/sec (Cp = 4 KJ/kg°C). The oil enters the cooler at 180°C and leaves at 80°C while cooling liquid enters the cooler at 30°C. Calculate the length of the pipe required if heat transfer co-efficient from oil to tube surface is 1720 $W/m^2°C$ and from metal surface to coolant is 3450 $W/m^2°C$. Neglect the resistance of the tube wall. **(10 Marks)**

7 a. State and explain Fick's law of diffusion. **(04 Marks)**

b. Distinguish between the nucleate boiling and film boiling. **(06 Marks)**

c. A vertical tube of 60 mm outside diameter and 1.2 m long is exposed to steam at atmospheric pressure. The outer surface of the tube is maintained at a temperature of 50°C by circulating cold water through the tube. Calculate the following:

i) The rate of heat transfer to the coolant.

ii) The rate of condensation of steam. **(10 Marks)**

8 a. Explain briefly the concept of a black body. **(04 Marks)**

b. State and explain,

i) Kirchoff's law.

ii) Planck's law.

iii) Wein's displacement law.

iv) Lambert's cosine law. **(08 Marks)**

c. Calculate the net radiant heat exchange per unit area for two large parallel plates at temperature of 427°C and 27°C respectively. $\epsilon_{hotplate} = 0.9$, $\epsilon_{coldplate} = 0.6$. If a polished aluminium shield is placed between them. Find the percentage reduction in the heat transfer. $\epsilon_{shield} = 0.04$. **(08 Marks)**

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06ME661

Sixth Semester B.E. Degree Examination, December 2011
Theory of Elasticity

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Derive the differential equations of equilibrium for the case of three dimensional stresses. **(10 Marks)**

b. The stress components at a point in a body are given by

$\sigma_x = 3xy^2z + 2x \qquad \tau_{xy} = 0$

$\sigma_y = 5xyz + 3y \qquad \tau_{yz} = \tau_{xz} = 3xy^2z + 2xy$

$\sigma_z = x^2t + y^2z$

Determine whether these components of stress satisfy the equilibrium equations or not at the point (1, -1, 2). If not, then determine the suitable body force vector required at this point so that these stress components are in equilibrium with the external force. **(10 Marks)**

2 a. Under what conditions are the following expressions for the components of strain at a point compatible?

$\epsilon_x = 2axy^2 + by^2 + 2cxy$

$\epsilon_y = ax^2 + bx$

$\gamma_{xy} = \alpha x^2y + \beta xy + ax^2 + \eta y$ **(10 Marks)**

b. The displacement components in a strained body are as follows :

$u = 0.01xy + 0.02y^2$

$v = 0.02x^2 + 0.01z^3y$

$w = 0.01xy^2 + 0.05z^2$.

Determine the strain matrix at the point P(3, 2, -5). **(10 Marks)**

3 a. Show that the Airy's stress function, $\phi = A\left(xy^3 - \frac{3}{4}xyh^2\right)$ represents stress distribution in a cantilever beam loaded at the free end with load P. Find the value of A, if $\tau_{xy} = 0$ at $y = \pm\frac{h}{2}$ where 'b' and 'h' are width and depth respectively of the cantilever. **(10 Marks)**

b. Given the stress function, $\phi = -\left[\frac{F}{h^3}\right]xy^3(3h - 2y)$. Determine the stress components and sketch their variation in a region included in y = 0, y = h, x = 0, on the side x positive. **(10 Marks)**

4 a. Derive an expression for the radial and circumferential stresses for the thick walled cylinder subjected to uniform internal and external pressure. Use plane stress case. **(12 Marks)**

b. A thick cylinder of inner radius 10cm and outer radius 15cm is subjected to an internal pressure of 12 MPa. Determine the radial and hoop stresses in the cylinder at the inner and outer surfaces. **(08 Marks)**

PART – B

5 Derive an expression for the radial and circumferential stresses for the rotating i) Solid disc ; ii) Circular disc with a hole. **(20 Marks)**

6 a. Explain the Prandtl's membrane analogy. **(10 Marks)**

b. A thin walled box section having dimensions 2a × a × t is to be compared with a solid circular section of diameter as show in the Fig.Q.6(b). Determine the thickness 't' so that the two sections have :

i) Same maximum shear stress for the same torque.

ii) The same stiffness. **(10 Marks)**

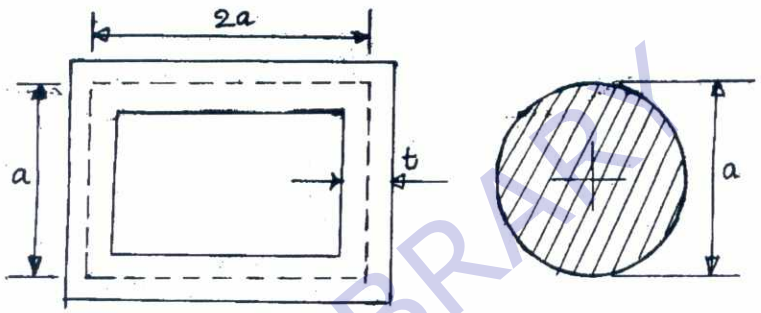

Fig.Q.6(b)

7 a. Define thermal stresses. Write down the thermoelastic stress – strain relations. **(10 Marks)**

b. The inner surface of a hollow sphere be at temperature T_i and the outer surface at temperature zero. If the system be in a steady heat flow condition and the temperature distribution is then given by $T = \frac{Tia}{(b-a)}\left(\frac{b}{r} - 1\right)$, determine the stress distribution. **(10 Marks)**

8 a. State and prove "uniqueness theorem". **(10 Marks)**

b. Write a short note on "principle of superposition". **(05 Marks)**

c. Write a short note on "Saint Venant principle". **(05 Marks)**

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06ME662

Sixth Semester B.E. Degree Examination, December 2011
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. Give the classification of the composites, based on the geometry of the reinforcements and explain them briefly. **(10 Marks)**

b. Explain briefly the construction of the laminated composites and sandwich composites. **(10 Marks)**

2 a. Explain with a neat sketch, the resin injection modeling technique. **(10 Marks)**

b. Explain with a suitable sketch, the thermoforming process. **(10 Marks)**

3 a. Write short notes on the application of composites in the following industries.
i) automobile ii) marine iii) recreational and sports equipment iv) missiles. **(12 Marks)**

b. Discuss the future potential of composites. **(08 Marks)**

4 a. Mention the assumptions made in the strength of material approach model to determine the four elastic modulii. **(04 Marks)**

b. Find the longitudinal (E_1) and transverse (E_2) Young's modulus of a unidirectional lamina when the composite is stressed along and perpendicular to the fibers. **(12 Marks)**

c. Find the longitudinal elastic modulus of a unidirectional glass /epoxy lamina with a 70% fiber volume fraction. Also find the ratio of the load taken by the fibers to that of composite.
Note : Young's modulus of the fiber is $E_f = 85GPa$ and Young's modulus of the matrix is $E_m = 3.4$ GPa. **(04 Marks)**

PART – B

5 a. Briefly explain the interlaminar stresses in a laminated composite. **(08 Marks)**

b. Write the assumptions of CLT. Derive the stress – strain relations for a classical laminate and represent the stress – strain variation in a laminate. **(12 Marks)**

6 a. What is the need for developing metal matrix composites? **(06 Marks)**

b. Write a note on selection of base metal in metal matrix composites. **(06 Marks)**

c. Explain the production of alumina fibers with a simple flow chart. **(08 Marks)**

7 a. With a neat sketch, explain the production of aluminum based composites, using particulates by melt – stiring technique. **(08 Marks)**

b. With the help of a flow chart, explain the power metallurgy technique for the production of metal matrix composites. **(04 Marks)**

c. Give an overview of the different fabrication processes for the production of metal matrix composites. **(08 Marks)**

8 a. Explain the influence of shape, size and distribution of particles on mechanical properties of metal matrix composites. **(10 Marks)**

b. Enumerate the mechanical properties of Al – SiC composites. **(10 Marks)**

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Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

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06ME665

Sixth Semester B.E. Degree Examination, December 2011
Non Traditional Machining

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the principle of modern machining process. What are the factors to be considered while selecting a process? **(07 Marks)**

b. Classify the modern machining processes. **(07 Marks)**

c. Compare the traditional machining with non-traditional machining processes. **(06 Marks)**

2 a. With a neat schematic diagram, explain the principles, equipment and operation of ultrasonic machining. **(10 Marks)**

b. What are the various parameters that affect the MRR in the ultrasonic machining process? Explain any two. **(06 Marks)**

c. Write a short note on the abrasive slurry. **(04 Marks)**

3 a. With a schematic diagram, explain briefly, the water jet machining process. **(07 Marks)**

b. List the variables that influence the rate of metal removal and accuracy of machining in abrasive jet machining. Explain any three. **(10 Marks)**

c. What are the applications of WJM? **(03 Marks)**

4 a. Explain with a neat diagram, electrochemical machining process. **(06 Marks)**

b. With a neat schematic diagram, explain the electrochemical honing process. **(08 Marks)**

c. Explain the advantages and limitations of ECM. **(06 Marks)**

PART – B

5 a. What is the chemical machining? Explain briefly the elements of the process. **(07 Marks)**

b. Explain briefly, the chemical milling process with the help of a neat flow chart. **(07 Marks)**

c. Discuss the advantages and applications of CHM. **(06 Marks)**

6 a. Briefly explain the rotary pulse generator in EDM process, with a neat sketch. **(06 Marks)**

b. Explain the various parameters that govern the metal removal rate, using a R-C circuit. **(08 Marks)**

c. Explain with a neat sketch, the traveling wire EDM. **(06 Marks)**

7 a. Explain with a neat sketch, the non-thermal generation of plasma and mechanism of metal removal. **(09 Marks)**

b. What are the different modes of operation of plasma torches? Explain. **(04 Marks)**

c. Discuss the plasma arc surfacing and plasma arc spraying. **(07 Marks)**

8 a. Explain with a neat sketch, the principle of operation and mechanism of metal removal in the laser beam machining. **(08 Marks)**

b. With a neat diagram, explain the generation and control of an electron beam. **(08 Marks)**

c. Discuss the advantages and limitations of LBM. **(04 Marks)**

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