(b) Prove that the Inverse Laplace transform of - [8]

$$\frac{S+1}{(S+2)(S+3)} = -e^{-2t} + 2e^{-3t}$$

UNIT-II

Q.2 Find the Laplace transformers of - [16]

(i) $f_1(t)$ = Cos at Cosh bt

(ii) $f_2(t)$ = t cos at

OR

Q.2 Find the inverse Laplace transform of - [16]

$\frac{S^2}{(S^2 + a^2)(S^2 + b^2)}$ using the convolution theorem.

UNIT-III

Q.3 (a) If $f(z) = u + iv$ be an alytic function, then find - [8]

$f'(z) =$ if

$u = e^x \cos y$

(b) If $f(z) = \begin{cases} \frac{x^3 y(y - ix)}{x^6 + y^2} & Z \neq 0 \\ 0, & Z = 0 \end{cases}$ [8]

Prove that $\lim_{z \to 0} \frac{f(z) - f(o)}{z - 0}$ along $y = mx$ and $y = ax^3$, two limits are not same

OR

Q.3 Expand the following in Lawrent's series - [16]

$$f(z)=\frac{1}{(z-1)(z-2)}, \text{ if}$$

(i) $1 < |Z| < 2$

(ii) $|Z| > 2$

(iii) $|Z| < 1$

UNIT-IV

Q.4 Use the method of Fourier transforms to determine the displacement u (x, t) of an infinite string, given that - [16]

$$\frac{\partial^2 u}{\partial x^2} = \frac{1}{C^2}\frac{\partial^2 y}{\partial^2 t}, \quad -\infty < x < \infty, \quad t > 0$$

Prove that the solution can be put in the form u (x, t) = $\frac{1}{2}[f(x+ct)+f(x-ct)]$

OR

Q.4 (a) Prove that $\frac{d}{dx}[x^n J_n(x)] = x^n J_{n-1}, \quad (x) n \geq 0$ [8]

where $J_n(x)$ is called Bessel function.

(b) Prove that $\frac{d}{dx}[x^{-n} J_n(x)] = -x^{-n} J_{n+1}(x), \quad n \geq 0$ [8]

UNIT-V

Q.5 From the following table of value of x and f(x) determine (i) f (0.23), (ii) f (0.29)

[16]

x	0.20	0.22	0.24	0.26	0.28	0.30
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7130

OR

Q.5 Apply Langrange's formula to find f(x) from the following table: [16]

f :	0	1	4	5
f (x) :	4	3	24	39

-------x-----x-------

3E1415

Roll No. _____ Total No of Pages: 3

3E1415

B. Tech. III – Sem. (Main/Back) Examination Feb. 2014

Production & Industrial Engineering

3PI5 Object Oriented Programming in C++

Common for ME/AE

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Unit of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1 (a) Discuss features of object oriented programming. [8]

(b) With the help of suitable example explain concept of method overloading & method overriding. [8]

OR

Q.1. (a) What is inheritance? Discuss types of inheritance and accessibility of public, protected & private member variables of super class (s) in the sub-class. [8]

(b) Write a class matrix with member variables R, C & M [ ] [ ] and member functions Read ( ), show ( ) & Matrix add (matrix).

Where: R & C are pulic int

M [ ] [ ] is int cersay of Size RX C

Using another class demo, demonstrate creation of two matrices of size 2 × 3 & displaying the addition of these matrices. [8]

UNIT-II

Q.2. Write technical note on following -

(a) Abstract class

(b) Friend function

(c) Dynamic array

(d) New & delete operators [4×4]

OR

Q.2. (a) State the difference between macro and inline function. Write & explain syntax for declaring, defining & calling each of them. [8]

(b) What is operator overloading? Write method code for overloading '+' operator for concatenating strings. [8]

UNIT-III

Q.3. (a) What are constructors & destructors? Discuss when constructor or destructor of a class is invoked. Discuss calling of a super class constructor in sub class constructor with dummy classes. [8]

(b) Explain role of keyword static when used before class member variable or class member method. Can we use this word before a class (I.e. Can we make a class static)? If yes, explain impact. [8]

UNIT-IV

Q.4. What are class templets & container classes? Write code to define any container class using class templets. [16]

OR

Q.4. Discuss in detail file handling & Stream classes in C++. [16]

UNIT-V

Q.5. Create a class Queue. Give appropriate member methods in the class to insert a new node in Queue, to delete an existing node from Queue and to display the Queue. Initialize FRONT & REAR pointers of Queue using a constructor of class. [16]

OR

Q.5. (a) What is dynamic memory allocation? [3]

(b) What is doubly linked list? [3]

(c) Write code segment to insert a new node into a doubly linked list at a given position p. Assume that START is pointer to FIRST node & END is pointer to last node of the doubly linked list. [10]

371

3E1414

Roll No. _____ Total No of Pages: 3

3E1414

B. Tech. III – Sem. (Main/Back) Examination Feb. 2014

Production & Industrial Engineering

3PI4 MANUFACTURING PROCESSES

Common for ME/AE

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

Attempt any five questions, selecting one question from each unit. All questions carry equal marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Unit of quantities used / calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form no.205)

1._____ 2._____

UNIT-I

Q.1 (a) Discuss Floor Moulding process and Pit Moulding process along with their applications. [8]

(b) Explain the functions of the following: - [8]

(i) Runner

(ii) Riser

(iii) Gate

(iv) Core

OR

Q.1 (a) Explain the working of different moulding machines used in foundry work with suitable neat diagrams. [8]

(b) Explain different heat zones in Cupola furnace with neat Sketch. [8]

UNIT-II

Q.2 Define Soldering and Brazing processes. What are the advantages of these processes? Discuss the common welding defects and their remedies. [16]

OR

Q.2 (a) What is the principle of Resistance Welding? Explain Spot welding technique. [10]

(b) Explain briefly Plasma Arc Welding and mention its applications. [6]

UNIT-III

Q.3 What are the advantages of Hot Working over Cold Working? Describe Direct and Indirect Extrusion process with sketches. [16]

OR

Q.3 Describe the principle of Rolling. Write the Various kinds of rolling mills along with their applications. [16]

UNIT -IV

Q.4 (a) Discuss the process of automization of producing Powders and its advantages. [8]

(b) Discuss in detail Pressure Less Compacting and Pressure Compacting Techniques. [8]

OR

Q.4 (a) Explain different Stages of manufacturing of Powder Metallurgy Components. [10]

(b) Write Short notes on Rapid Prototyping technique. [6]

UNIT-V

Q.5 Describe the working principle and typical application of the following moulding processes: - [16]

(i) Compression Moulding.

(ii) Transfer Moulding .

OR

Q.5 Describe briefly the process of Injection Moulding as used for producing plastic component. [16]

----------*----------

3E1455

Roll No. _____ Total No of Pages: 7

3E1455

B. Tech. III – Sem. (Main) Examination Feb. 2014

3CE5 Fluid Mechanics

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

Attempt Five questions in all selecting one question from each unit. Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly.

Units of quantities used / calculated must be stated clearly.

1. _____ 2. _____

UNIT-I

Q.1 (a) (i) Explain what do you understand by compressibility of fluids and how it is affected by temperature change. [2]

(ii) Explain effect of temperature on viscosity of fluids which are -

(a) Liquid in nature [2]

(b) Gaseous in nature. [2]

(b) By how much does the pressure in a cylindrical jet of water 4mm in diameter exceed the pressure of the surrounding atmosphere if $\sigma = 0.0075$kg(f)/m. [4]

(c) A cylinder of 0.10m diameter rotates in an annular sleeve of 0.102m internal diameter at 100 rpm. The cylinder is 0.2m long. If the dynamic viscosity of the lubricant between the two cylinders is 1.0 poise, find the torque needed to drive the cylinder against viscous resistance. Assume Newton law of viscosity to be applicable. [6]

OR

Q.1 (a) Through a narrow gap of height h, a thin plate of large extant is pulled at a velocity 'v'. On one side of the plate is oil of viscosity μ_1 and on the other side oil of viscosity μ_2. Calculate the position of the plate so that -

(i) Shear force on the two sides of the plates is equal.

(ii) The pull required to drag the plate is minimum. [8]

(b) (i) What do you understand by vapour pressure and how it is affected by the external parameters? [2]

(ii) A glass tube 0.25 mm in diameter contains a mercury column with water above the mercury. The temperature is 20^0C at which the surface tension of mercury in contact with water is 0.037kg(f)/m. What will be the capillary depression of the mercury? [Angle of contact $\theta = 130^0$]. [6]

UNIT-II

Q.2 (a) A hollow cylinder of outer diameter 1.25m, length 3.5m and specific weight 75537N/m^3, floats just in stable equilibrium in the sea water. Find the thickness of the cylinder for which cylinder will keep floating. [Specific gravity of sea water =1.0051] [8]

(b) A rectangular door covering an opening 3m wide and 2m high in a vertical wall is hinged about its vertical edge by two pivots placed symmetrically 0.25m from either end. The door is locked by a clamp placed at the center of the vertical edge. Determine the reaction of the two hinges and the clamp, when the height of water is 1.5m above the top edge of the opening. [8]

OR

Q.2 (a) The pressure between two points A and B in a pipe conveying oil of specific gravity 0.8 is measured by an inverted U tube. The column connected to point B stands 1.6m higher than that at point A. A commercial pressure gauge attached directly to the pipe at A reads 1.125 kg(f)cm^2, determine its reading when attached directly to the pipe at B. [8]

(b) A wooden cylinder of circular section uniform density, specific gravity 0.6 is required to float in oil of specific gravity 0.8. If the diameter of the cylinder is 'd' and its length is 'ℓ', show that ℓ cannot exceed about '0.817 d' for cylinder to float with its longitudinal axis vertical. [8]

UNIT-III

Q3 (a) A tank of oil 6m long contains 1.5m depth of oil (specific gravity 0.8). If the tank accelerates up a 30^0 inclined plane at 3.6m/s^2, what is the angle the oil surface wakes which horizontal? Also find the pressure intensities at the bottom of the tank at the front and rear cuds. [8]

(b) Explain what do you understand by vortex motion? Also explain free and forced vortex motion. [3]

[80]

(c) In a free cylindrical vortex of water the tangential velocity at a radius of 0.12m from the axis of rotation is found to be 7.2m/s and the intensity of pressure is 2.5kg(f) /cm^2. Find the intensity of pressure at a radius of 0.24m from the axis. [5]

OR

Q.3 (a) Differentiate between the following:

(i) Velocity Potential and Stream Function. [1]

(ii) Rotational and Irrotational Flow. [1]

(iii) Uniform and Non Uniform Flow. [1]

(iv) Steady and Unsteady Flow. [1]

(v) Streamline, Path line and Streak lines. [2]

(b) The velocity components in a two dimensional flow field are expressed as -

$$u = \frac{y^3}{3} + 2x - x^2 y$$

$$v = xy^2 - 2y - \frac{x^3}{3}$$

(i) Show that these functions represent a possible case of irrotational flow.

(ii) Obtain an expression for stream function ψ.

(iii) Obtain an expression for velocity potential φ. [4+3+3=10]

UNIT-IV

Q.4 (a) A venturimeter is installed in a pipeline 400mm is diameter. The throat - pipe diameter ratio is 1:3. Water flows through the installation. The pressure in the pipeline is 1.405kg/cm^2 and the vacuum in the throat is 37.5 cm of mercury. If

4% of the differential head is lost between the gauges, find the flow in the pipeline. [8]

(b) Two large plates are spaced 50mm a part. If the velocity profile between the plates is represented by $v = V_{max}(1-1600\ r^2)$, where r is measured in meters from the centerline between the plates. Find the momentum correction factor. [8]

OR

Q.4 (a) A reservoir $4.5 \times 10^4\ m^2$ in area is to be controlled by a rectangular weir with its crest level at R.L. 35.00m. It is intended to provide such a length of weir that will lower the water level from R.L. 36.30m to R.L. 35.60m in half hour time. Find the length of the weir. The discharge over the weir is given by the formula.

$Q = 1.9\ LH^{3/2}$, where Q = Discharge in cumec,

L = Crest length in m.

H= head over the weir in m. [8]

(b) A Borda mouthpiece of 35mm diameter discharges under a constant head of 1.4m. If the velocity coefficient for the entrance section of the mouthpiece is 0.95, find -

(i) The coefficient of contraction and the discharge when the mouthpiece is running free. [3+2]

(ii) The discharge when the mouthpiece is running full assuming that vena-contracta is formed in the mouthpiece and coefficient of contraction being the same as in (i) and allowing for the loss of energy between the vena-contracta and the outlet. [3]

UNIT-V

Q.5 (a) Briefly explain the following formula used in calculating head loss due to friction in pipes -

(i) Darcy Weisbach Formula

(ii) Chezy Formula

(iii) Hezen William Formula

(iv) Mannings Formula [6]

(b) Water is to be transferred from a reservoir thought a pipe of 15 cm diameter and 180m long a point 13.0 m below the open surface of the reservoir. From here it branches into two pipes, each of 11cm diameter, one of which is 48m long discharging to atmosphere at a point 18m below reservoir level. Assuming a Darcy friction coefficient = 0.032 for all pipes, calculate discharge from each pipe. Neglect minor losses at junction. [10]

OR

Q.5 (a) What do you understand by -

(i) Hydraulic Gradient Line.

(ii) Total Energy Line. [3]

(b) What do you understand by Water Hammer and Water Hammer wave velocity? [2+2=4]

(c) Water is being pumped at the rate of 2 liter/sec to an overhead tank through a 15 cm diameter, 300m long delivery pipe. In the tank, the pipe discharge freely at a height of 15m above the pump. If the Darcy friction factor is f = 0.03 for the pipe, determine the pressure developed by the pump on its delivery side and the power required to lift the water. Assume the first 285m of delivery pipe is horizontal and rest is vertical. [6]

Also sketch the hydraulic gradient line from the pump to the overhead tank and calculate the efficiency of Power transmission of pipeline. [2+1]

3E1416

Roll No. _____ Total No of Pages: 4

3E1416

B. Tech. III Sem. (Old Back) 2006-07,07-08 and 08-09 Feb. 2014

Mechanical Engineering

3ME6 ADVANCED ENGINEERING MATHEMATICS

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1. _____ 2. _____

UNIT-I

Q.1 (a) Expand $f(x) = |\cos x|$ in a Fourier series in the interval $(-\pi, \pi)$. [8]

(b) Obtain the first three coefficients in the Fourier cosine series for y, where

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

[8]

OR

Q.1 (a) Find the half range cosine series for the functions: $f(x) = (x-1)^2$; $0 < x < 1$;

hence show that $\pi^2 = 8\left(\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + ------\right)$ [8]

(b) Find the Fourier sine and cosine transforms of -

$$f(x) = \begin{cases} x, & 0 < x \le 1 \\ 2-x, & 1 < x < 2 \\ 0, & x \ge 2 \end{cases}$$ [8]

UNIT-II

Q.2 (a) A string is stretched between the fixed points (0,0) and (ℓ,0) and released from rest from position $u = A\sin\left(\frac{\pi x}{\ell}\right)$. Find u (x, t) [8]

(b) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$

For the conditions-

(i) u (0, y) = 0 = u (ℓ, y) = 0

(ii) u (x, 0) = 0 and u (x, a) = sin $\frac{\pi x}{\ell}$ [8]

OR

Q.2 (a) Solve by laplace transform (0^2+9) y = Cos2t, given that y(0) = 1 ; $y\left(\frac{\pi}{2}\right) = -1$

[8]

(b) Solve $\frac{\partial u}{\partial t} = 2\frac{\partial^2 u}{\partial x^2}$; given u (0, t) = 0 = u (5, t) and u (x, 0) = 10 Sin u πx. [8]

UNIT-III

Q.3 (a) If f (z) = u + iv is an analytic function of z = x + iy and $u - v = \frac{e^y - \cos x + \sin x}{\cosh y - \cos x}$.

Find f (z), subject to the condition $f\left(\frac{\pi}{2}\right) = \frac{3-i}{3}$ [8]

(b) Show that under the transformation $\omega = \frac{z-i}{z+i}$, real axis in the z plane is mapped into the circle | ω | = 1. What portion of the z plane corresponds to the interior of the circle? [8]

OR

Q.3 (a) Evaluate by Cauchy's integral formal $\int_C \frac{dz}{e^{z(z+\pi i)}}$ where C is $|z+3i| = 3$. [4]

(b) Expand the function $\frac{1}{z(z-1)(z-2)}$.

(i) for $|z-1| < 1$

(ii) for $|z| > 2$in laurent's series . [6]

(c) Find the residue of $\frac{z^2 - 2z}{(z+1)^2(z^2+4)}$ at all its poles in the finite plane. [6]

UNIT-IV

Q.4 (a) Show that $\int x J_0^2(x)\,dx = \frac{x^2}{2}\left[J_0^2(x) + J_1^2(x)\right] + c$ [8]

(b) Prove that $J_n''(x) = \frac{1}{4}\left[J_{n-2}(x) - 2J_n(x) + J_{n+2}(x)\right]$ [4]

(c) Express $J_{3/2}(x)$ and $J_{-(3/2)}(x)$ in terms of sine and cosine functions. [4]

OR

Q.4 (a) Prove that -

$$P_n(x) = \frac{1}{2^n \lfloor n} \cdot \frac{d^n}{d_x n} (x^2 - 1)^n$$ [8]

(b) Prove that -

(i) $\int_{-1}^{1} P_n(x)\,dx = 0;\ n \neq 0$ and

(ii) $\int_{-1}^{1} P_0(x)\,dx = 2$ [8]

UNIT-V

Q.5 (a) Solve: $\Delta = \frac{1}{2}\delta^2 + \delta\sqrt{1 + \frac{\delta^2}{4}}$ [4]

(b) Prove that $\delta [f(x) . g(x)] = \mu [f(x)] \delta [g(x)] + \mu [g(x)] \delta [(f(x)]$ [4]

(c) Evaluate $\int_0^1 \frac{dx}{1+x^2}$ by

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule and

(iii) Simpson's $\frac{3}{8}$ rule.

Hence obtain the value of Π by result obtained. [8]

OR

Q.5 (a) Find y' (0) and y'' (o) from the data - [8]

x :	0	1	2	3	4	5
y :	4	8	15	7	6	2

(b) Use lagrange's Interpolation formula to obtain f (x) for x = 12. [8]

x	0	1	4	5
f(x)	4	3	24	39

3E1411

Roll No. _____ Total No of Pages: 4

3E1411

B. Tech. III – Sem. (Old Back) 2006-07, 07-08 and 08-09 Examination Feb. 2014

3MEI MECHANICS OF SOLIDS

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1. NIL 2. NIL

UNIT-I

Q.1 (a) The loading on a steel bar of 30mm diameter is as shown in fig 1.1(a). Find the elongation of the bar F=205GPa [8]

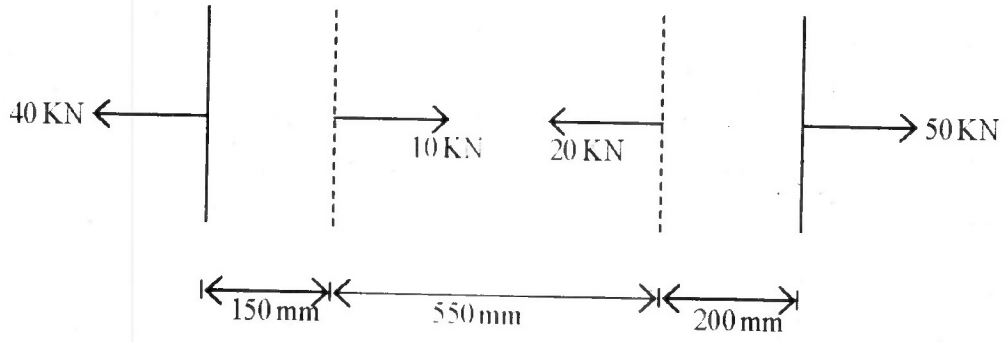


fig .1.1(a)

(b) Explain the terms:

(i) Volumetric strain. [2]

(ii) Factor of safety. [2]

(iii) Poisson's ratio. [2]

(iv) Bulk modulus [2]

OR

Q.1 (a) A round bar of length L tapers uniformly from small diameter d_1 at one end to bigger diameter d_2 at the other end. Show that the extension produced by a tensile axia load P is $(\delta) = \frac{4PL}{\Pi d_1 d_2 E}$

* E = modulus of elasticity [8]

(b) What do you mean by temperature stress? Explain [8]

UNIT-II

Q.2 (a) Prove the relations:

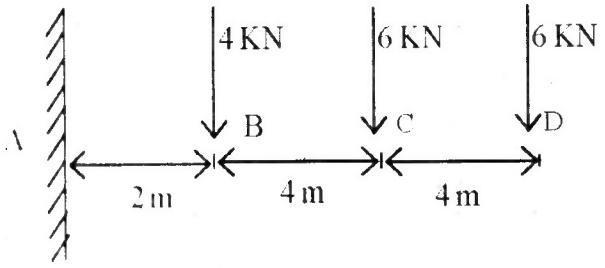
$$\frac{\sigma}{y} = \frac{M}{I} = \frac{E}{R}$$

Where M = Bending moment, I = Moment of Intertia, σ Bending stress in a fibre [8]

(b) A uniform beam of length L is carrying a uniformly distributed load w per unit length and is simply supported at its ends. What would be maximum bending moment and where does it occur? [8]

OR

Q.2 (a) A cantilever is loaded as shown in fig 2.1(a). Draw the shear force and bending moment diagrams. [8]



(b) A simply supported beam of 8m span carries point loads of 24 kN and 40 kN at distances of 2m from each end. Draw the shear force and bending moment diagrams. [8]

UNIT-III

Q.3 (a) Prove $\frac{T}{J}=\frac{\tau}{r}=\frac{6\theta}{l}$ in case of torsion of a circular shaft. [8]

(b) A solid steel shaft transmits 100 KW at 150 rpm. Determine the suitable diameter of the shaft if the maximum torque transmitted exceeds the mean by 20%, in each revolution the shear stress is Not to Exceed 60MPa. Also find the maximum angle of twist in a length of 4m of the shaft, θ = 80 GPa. [8]

OR

Q.3 (a) Derive a relation for the Eulers crippling for a column when it has both ends hinged. [8]

(b) Two steel struts have the same cross-sectional areas, one is a solid one and the other is hollow with internal diameter three-fourth of the external diameter. Compare the ratio of the strength of the solid steel strut to that of the hollow one. [8]

UNIT-IV

Q.4 (a) At a point in a crank shaft the stresses on two mutually perpendicular planes are 30 MPa (tensile) and 15MPa (tensile). The shear stress across these planes is 10 MPa. Find the Normal and shear stress on a plane making an angle 30° with the plane of first stress, find also magnitude and direction of resultant stress on the plane. [8]

(b) What are the main theories of failure for a material? Explain their relatives use. [8]

OR

3E1413

Roll No. _____ Total No of Pages: 3

3E1413
B. Tech. III – Sem. (Old Back) 2006-07, 07-08 and 08-09
Feb. 2014
Mechanical Engg.
3ME3 ENGNEERING THERMODYNAMICS

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting one question from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1. Steam Table 2. _____

UNIT-I

Q.1 (a) What do you mean by thermodynamics and thermodynamics system. [8]

(b) What is temperature Scale? How is temperature scale established? Explain standard fixed point is thermodynametry. [8]

OR

Q.1 (a) Explain the zeroth law of thermodynamics. [8]

(b) Differentiate between absolute and gauge pressures. What do you understand by vacuum pressure. [8]

UNIT-II

Q.2 (a) Explain the first law of thermodynamics. And also explain its application. [8]

(b) What is a thermal energy reservoir and what are limitations of first law of thermodynamics. [8]

OR

Q.2 (a) State and prove Clausius statement. [8]

(b) On engine operating on a Carnet cycle works within the temperature limits of 600K and 300K. If the engine receives 200 KJ of heat evaluate the work done and thermal efficiency of engine. [8]

UNIT-III

Q.3 (a) What are the Maxwell Relations? Derive the expressions. [8]

(b) What is available and unavailable energy? Explain the concept of quality of energy. [8]

OR

Q.3 (a) Derive and explain the Clausius - Clapeyron equation. [8]

(b) Prove that: $C_p - C_v = -T\left(\frac{\partial V}{\partial T}\right)_p^2\left(\frac{\partial P}{\partial V}\right)_T$ [8]

UNIT-IV

Q.4 (a) Draw Parayton cycle on P-V and T-S diagram and derive an Expression for cycle efficiency. [8]

(b) Compare the relative advantages and disadvantages of four stroke and two stroke cycle engines. [8]

OR

Q.4 (a) Derive the expression for air standard efficiency of Otto cycle. [8]

(b) A Four stroke engine working on Otto cycle has a swept Volume of 0.1 m^3.The compression ratio is 7 and condition at the start of the cycle, 1 bar pressure as 360K temp. The heat addition at constant Volume is $100K_3$ per cycle. Find Air standard efficiency, Mean effective pressure, Peak pressure and temperature of the cycle. [8]

UNIT-V

Q.5 (a) A simple rankine cycle works between 35 bar and 0.2 bar. The initial condition of steam being dry saturated. Calculate [10]

(i) Cycle efficiency

(ii) Rankine Efficiency

(iii) Steam consumption.

(b) Explain the term saturated steam as applied to steam. [6]

OR

Q.5 (a) Describe a simple Vapour compression cycle giving clearly its flow diagram. [8]

(b) Explain why the Rankine cycle rather than Carnot cycle is used as a standard of reference for the performance of steam plants. [8]

-----X--------X-----

360

3E1412

Roll No. _____ Total No of Pages: 4

3E1412
B. Tech. III SEM (Old Back) 2006-07, 07-08 and 08-09
Feb. 2014
Mechanical Engg.
3ME2 Material Science and Engg.

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1._____ 2._____

UNIT-I

Q.1 (a) What are the Crystal Imperfection? Explain Crystal defects with neat sketches.[8]

(b) Calculate the Miller Indices of a plane passing through gallium Crystal (orthorhombic) and Cutting three axes a, b, & c at 1.763, 8.04 & 1.915 A°. The lattice parameter for gallium are – a= 3.526A°, b 4.020 A°, C 7.660 A° [8]

OR

Q.1 (a) Explain following: - [8]

(i) Allotropy.

(ii) Miller Bravais Indices.

(iii) Total No. of atoms per unit cells.

(b) Show that the atomic pocking factor for FCC & BCC structure are 0.74 & 0.68 respectively. [8]

UNIT-II

Q.2 (a) What are the various theories of plastic deformation? Explain? [6]

(b) Explain following: - [10]

(i) Recovery & Recrystallization.

(ii) Phenomenon of Slip & Twinning.

(iii) Dislocation

OR

Q.2 (a) What do you mean by "Preferred orientation "Discuss its Causes & Effect on the properly of metals. [8]

(b) Discuss about Crystallographic slip planes & direction. [8]

UNIT-III

Q.3 (a) Explain the TTT Curve, Explain Conical Cooling rate. [8]

(b) Write Short note on – [8]

(i) Transformation of austenite into Pearlite.

(ii) Martensite Transformation in Steel.

OR

Q.3 (a) Give Classification of Equilibrium diagram, Explain Iron-carbon Equilibrium diagram. [8]

(b) Explain the binary System when two metals are completely soluble in liquid state but partly soluble in the solid state with Suitable Example. [8]

UNIT- IV

Q.4 (a) Explain term hardenability. Explain the factors effecting hardenability. [6]

(b) Discuss over – heated & burnt steel, its causes & remedies. [6]

(c) Explain Annealing & Tempering processes. [4]

OR

Q. (a) Explain the chemical heat treatment Procedure for steel. [8]

(b) Write Short note on – [8]

(i) Normalizing.

(ii) Tamper brittleness.

(iii) Cast Iron & its types.

UNIT-V

Q.5 (a) Discuss - [16]

(i) Fibers & Matrix Materials.

(ii) Classification of Steels.

(iii) BIS Standard

(iv) Structural Classes of Material.

Q.5 (a) What are the effects produced by alloying Element on the Structure & Properties of Steel. [6]

(b) Write short note on - [10]

(i) Muntz Metal

(ii) 18-4-1 high speed steel.

(iii) White cast Iron.

(iv) Ni- hard & Ni-resist.

3E1418

Roll No. _____ Total No of Pages: 4

3E1418

B. Tech. III Sem. (Old Back) 2006-07, 07-08 and 08-09

Feb. 2014

Mechanical Engineering

3ME6 ADVANCED ENGINEERING MATHEMATICS

Time: 3 Hours **Maximum Marks: 80**

Min. Passing Marks: 24

Instructions to Candidates:-

*Attempt any **five questions**, selecting **one question** from **each unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Unit of quantities used / calculated must be stated clearly.*

Use of following supporting material is permitted during examination.

1. _____ 2. _____

UNIT-I

Q.1 (a) Find the Fourier series for $f(x) = |x|$ in the interval $(-\pi, \pi)$ [8]

(b) Obtain the Laplace transformation of the function [8]

$f(t) = \sin t \quad 0 < t < \pi$

$= 0 \quad t > \pi$

OR

(a) Solve the integral equation - [8]

$\int_0^\infty f(x) \cos \lambda x \, dx = e^{-\lambda}$