DTU/11/1014

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FIRST SEMESTER | **B.Tech. (ALL)**

END SEMESTER EXAMINATION NOV.-DEC.-2011

AM-101 MATHEMATICS-I

Time: 3 Hours | *Maximum Marks : 70*

Note : Answer *ALL* by selecting *TWO* parts from each question. Assume suitable missing data, if any.

1[a] State Cauchy's integral test. Hence or otherwise discuss the convergence of $\sum \frac{1}{n^p}$.

[b] Discuss the convergence and absolute convergence of the following series;

$$x - \frac{x^2}{2} + \frac{x^3}{3} \ldots\ldots\ldots + (-1)^{n+1}\frac{x^n}{n} + \cdots \ldots\ldots$$

[c] Calculate the approximate value of $\sqrt{17}$ by choosing a suitable function and writing its Taylor's series, correct upto 4^{th} decimal place.

7+7

2[a] Show that the curvature at the point $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on the folium $x^3 + y^3 = 3xy$ is $-\frac{8\sqrt{2}}{3a}$.

[b] Find the surface area of the solid generated by revolving an arc of the cycloid $x = a(\theta - sin\theta)$, $y = a(1 - cos\theta)$ $0 \le \theta \le 2\pi$ about the x-axis.

[c] Find the area included between the cardiod $r = a(1 + cos\theta)$ and the circle $r = a$.

7+7

3[a] If $u = log(x^3 + y^3 + z^3 - 3xyz)$, show that

$$\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 . u = \frac{-9}{(x+y+z)^2}$$

[b] Locate the stationary point of
$f(x,y) = x^4 + y^4 - 2x^2 + 4xy - 2y^2$ and determine their nature.

[c] At a distance of 50 meter from the foot of a tower, the elevation of its top is 30°. The possible errors in the measuring of distance and the elevation are 2 cm and 0.05 degree respectively. Find the approximate error in the calculated height.

7+7

4[a] Evaluate $\int_0^1 \int_x^{\sqrt{2-x^2}} \frac{xdydx}{\sqrt{x^2+y^2}}$ by changing in the polar co-ordinates

(ii) Show that $\Gamma n = \int_0^1 \left(log\frac{1}{y}\right)^{n-1} .dy$

[b] Find the volume bounded by cylinder $x^2 + y^2 = 4$ and the hyperboloid $x^2 + y^2 - z^2 = 1$

[c] Find the volume bounded by xy-plane, the cylinder $x^2 + y^2 = 1$ and the plane $x + y + z = 3$

7+7

5[a] (i) If $u = x + y + z$, $v = x^2 + y^2 + z^2$ $w = yz + zx + xy$ prove that grad u, grad v and grad w are coplanar.

(ii) Find whether the vector field $\bar{F} = \cosh(x+y)\,(\hat{\imath} + \hat{\jmath})$ is conservative.
If it is so, find the potential function.

[b] State the Divergence theorem. Verify it for $\bar{F} = 4xz\hat{\imath} - y\hat{\jmath} + yz\hat{k}$ taken over the cube bounded by the planes $x = 0 = y = z$ and $x = 1 = y = z$.

[c] Verify Green's theorem in the plane for $\int_c [(3x^2 - 8y^2)dx + (4y - 6xy)dy]$ where C is the boundary of the region bounded by $x = 0$, $y = 0$ and $x + y = 1$.

7+7

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Roll No. 1014

SECOND SEMESTER

B.Tech. (Group A)

END SEMESTER EXAMINATION ***MAY-2012***

EN-112 ENVIRONMENTAL SCIENCE – LoL

Time: 3:00 Hours ***Max. Marks : 70***

Note : Answer any ***FIVE*** questions.
Assume suitable missing data, if any.

1 Define atmosphere. Briefly explain the chemical composition and vertical temperature profile of atmosphere. What is the relevance of different layers of atmosphere? Explain. **14**

2 What are biogeochemical cycles? What is the environmental significance of nutrient cycling? Briefly explain the nitrogen cycling with a mention of nitrification and denitrification and the role of microorganisms involved. **14**

3 What is an ecosystem? Explain the structural and functional characteristics of an ecosystem. Briefly explain the types of forest ecosystem with respect to geographical classification. **14**

4 Briefly explain the sources, effects and control of gaseous and particulate air pollutants. Also mention the ambient air quality standards prescribed in India. **14**

5 Enumerate the physical, chemical and biological characteristics of water used to establish its quality for drinking with a mention of standards prescribed for each parameter. **14**

6 Differentiate between conventional and non-conventional sources of energy. What are the environmental merits and demerits of solar energy? **14**

7 Discuss the methodology followed for municipal solid waste treatment and management. **14**

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FIRST SEMESTER

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B.Tech. (AP)

END SEMESTER EXAMINATION NOV.-DEC.-2011

AP-103 APPLIED PHYSICS-I

Time: 3 Hours *Maximum Marks : 70*

Note : Answer any *FIVE* questions.
Assume suitable missing data, if any.

1[a] State the fundamental postulates of special theory of relativity. Derive Lorentz transformation equations for position & time. 7

[b] Show that the relativistic kinetic energy (K.E.) of a particle is given by

$$K.E. = (m - m_0)c^2$$

Where m and m_0 are relativistic and rest mass of the particle & c, the speed of light. 7

2[a] Obtain expression for relativistic addition of velocities using Lorentz transformation equations. 6

[b] The frequency of a damped simple harmonic oscillator is given by

$$\omega'^2 = \frac{s}{m} - \frac{r^2}{4m^2} = \omega_0^2 - \frac{r^2}{4m^2}$$ **2x4=8**

(i) $\omega_0^2 - \omega'^2 = 10^{-6}\omega_0^2$, calculate the values of quality factor and the logarithmic decrement.

(ii) If $\omega_0 = 10^6$ *and* $m = 10^{-10}$ *kg*. Calculate the stiffness of the system and the resistive constant.

(iii) If the maximum displacement at t=0 is 10^{-2}m, calculate the energy of the system and relaxation time for energy.

(iv) Calculate the energy loss in the first cycle.

3[a] Define quality factor of damped harmonic oscillator. Deduce its expression in terms of relaxation time. 7

[b](i) Explain the sharpness of resonance and explain the condition when resonance is sharp. 3½

(ii) Derive am expression for transverse wave in a string having linear density ρ and tension T. 3½

4[a] Derive an expression for the amplitude of forced vibrations of a mechanical system in steady state. 7

[b] Obtain an expression for reflection and transmission co-efficients of amplitude of longitudinal waves propagating from one medium to another medium. 7

5[a] Describe and explain the formation of Newton's rings with a suitable diagram for the reflected light system. Prove that in reflected light, diameters of the dark rings are proportional to the square root of natural numbers. 7

[b] Explain Rayleigh's criterion of resolution. Derive the expression for resolving power of a plane transmission grating. 7

6[a] What is meant by (i) plane polarized (ii) circularly polarized & (iii) elliptically polarized light? Briefly describe how these can be produced and detected using Nicol prism and quarter wave plate. 5

[b] A half wave plate is constructed for wavelength of 6000 Å. For what wavelength does it work as a quarter wave plate? 5

[c] Explain the following terms:

(i) Population Inversion

(ii) Point out the units of co-efficients of stimulated & spontaneous emission 4

7[a] What is the difference between step index and graded index optical fibres? Discuss the mechanism of light propagated in both types of fibres. Point out the advantages of graded index optical fibre over step index optical fibre. 5

[b] Draw the schematic diagram of He-Ne laser and describe its method of working. 5

[c] Explain the following terms:

(i) Numerical Aperture (N.A.)

(ii) Acceptance cone 4

8 Write short notes on the following: 3½ x4=14

[a] Spherical & Chromatic aberrations.

[b] Comparison between Huygens & Ramsden's eyepiece

[c] Zone plate

[d] Brewster's law

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Roll No. 1014

SECOND SEMESTER

B.Tech. (GROUP A)

END SEMESTER EXAMINATION MAY-2012

AP/AC-114 ENGINEERING MATERIALS

Time: 3:00 Hours Expected - 49/70 *Max. Marks : 70*

Note : Answer any *FIVE* questions from Part-A.
Answer any *FIVE* questions from Part-B.
Assume suitable missing data, if any.

PART-A ~~Set~~ - 27 1/2

1[a] What do you understand by drift and diffusion currents in the case of semiconductors. Derive the relation between diffusion coefficient and mobility. 4

[b] Derive expression for the densities of electron in the conduction band in an intrinsic semiconductor. 3

2[a] Derive the relation for Fermi energy level in an intrinsic semiconductor and show that it lies approximation half way between the valance and conduction bands. 4

[b] For the intrinsic semiconductor with energy gap of 0.7eV, determine the position of Fermi-level at 300K of $m^*_p = 6m_e^*$. 3

3[a] Distinguish between ferromagnetism, ferrimagnetism and antiferromagnetism. 3

[b] What are ferrites? Why ferrites are superior than ferromagnetic materials? 2

[c] Show the variation of magnetic susceptibility with temperature for paramagnetic and ferromagnetic materials. 2

4[a] Discuss different types of polarizations. Sketch frequency vs polarization plot for all polarizations and hence show electrical and optical frequency regions. 5

[b] Dielectric constant of Argon at 0°C and one atmosphere is 1.000435. Calculate the polarizability of the atom. 2

5[a] In an orthorhombic crystal lattice plane cuts intercepts of length 3**a** , -2**b** and $\left(\frac{3}{2}c\right)$ along three axes **a, b** and **c** where, are primitive vectors of unit cell. Deduce the "Miller" indices of the plane. 2

[b] Compare the densities of lattice in (111) and (110) planes of simple cubic lattice. 2

[c] Show that the Maxwell's equations are inconsistent with Meissner effect in super conductors. 3

6[a] Differentiate Type-I and Type II super conductors. 2

[b] The critical field for niobium is 1.0×10^4 A/m at 8.0K and 2.0×10^5 A/m at 0K. Calculate the transition temperature of the element. 3

[c] Write short notes on High temperature super conductors. 2

7[a] Calculate the energy difference between the ground state and first excited state for an electron (e^-) in 1-Dimensional rigid box of length 1Å (Given: mass of $e=9.1\times10^{-31}$kg, $h=6.62\times10^{-34}$ J.s). 3

[b] Using free electron (e^-) theory, derive expression for electrical conductivity. 2

[c] Discuss about incremental velocity and relaxation times in metals. 2

PART-B 21½

1[a] Write composition, properties and uses of brasses. 2½ 3.5

[b] What do you mean by conducting polymers? Illustrate the technological applications of these materials. 2½ 3.5

2[a] What is refractory? Discuss all the important properties of refractory materials. 2½ 3.5

[b] What is composite material? Discuss all the environmental effects which affect the composite materials. 2½ 3.5

3[a] How many types of cast iron are used in engineering? Discuss their composition, properties and uses. 2 3.5

[b] Discuss an important application of ion-exchange resins in detail. 3.5

3

4[a] How will you prepare polyparaphenylene? Discuss its uses in detail. 3.5

[b] What is super alloy? Discuss its composition, properties and uses in engineering with suitable examples. 3.5

5[a] Discuss about the specific effects of all important alloying elements. 3.5

[b] What do you mean by ceramics? Distinguish between whitewares and stone wares. 3.5

6[a] Discuss all important steps involved in the manufacturing of refractory articles. 3.5

[b] What is the role of matrix in composites? Distinguish between metal matrix composites and polymer matrix composites. 3.5

7. Write short notes on any TWO of the following:

[a] Conduction mechanism in conducting polymers

[b] Glazing process

[c] Utility of thermosetting materials in advanced composite materials.

2×3.5

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SECOND SEMESTER

B.Tech. (ME)

END SEMESTER EXAMINATION

MAY-2012

ME-115 BASIC MECHANICAL ENGINEERING

Time: 3:00 Hours

Max. Marks : 70

Note : Answer any *FIVE* questions selecting at least *TWO* question from each part.
Assume suitable missing data, if any.

PART-A

1[a] What is a steady flow process. State all the assumptions made for such a Flow Process. Explain the concept of flow work. 4

[b] A centrifugal pump delivers 2750 kg of water per minute from initial pressure of 0.8 bar absolute to a final pressure of 2.8 bar absolute. The suction is 2m below and the delivery is 5m above the centre of pump. If the suction and delivery pipes are 15 cm & 10 cm diameter respectively, make calculation for the power required to run the pump. 10

2[a] Explain thermal efficiency of a heat engine. Can it be 100 percent? Deduce the concept of Clausius inequality. 7

[b] Define entropy. What are the two requirements for a process to be isentropic? Also prove the entropy is a point function. 7

3[a] Derive an expression for the air standard efficiency of the Diesel cycle in terms of the compression ratio, cut off ratio and the adiabatic index. 7

[b] An air standard Otto cycle is designated to operate with the following data:

Maximum cycle pressure and temperature: 5 MPa and 2250 K.

Minimum cycle pressure and temperature: 0.1 MPa and 300 K.

Determine the network output per unit mass of working fluid and the thermal efficiency. 7

4[a] Obtain an expression for total pressure and corresponding centre of pressure on a plane surface immersed in a fluid vertically. 7

[b] A cubical block weighing 4.5 N and having a 40 cm edge is allowed to slide down an inclined plane surface making an angle of 30° with the

horizontal on which there is a uniform layer of oil 0.005 cm thick. If the expected steady state velocity of the block is 12.5 cm/s, determine the viscosity of the oil. Also express the kinematic viscosity in stokes if the oil has a mass density of 800 kg/m^2. 7

PART-B

5[a] Explain various types of manufacturing process with examples. 5

[b] Discuss NC, CNC & DNC machines. How a CNC machine has changed the whole machine scenario. 5

[c] Discuss the desirable properties of moulding sand. 4

6[a] Discuss various types of welding. Explain TIG welding. Also explain the defects occurred during welding. 7

[b] What is surface Mount Technology? Explain the automated assembly system. 7

7[a] What are the line & angular measurements? Explain the comparators. 5

[b] Write advantages and limitations of unconventional machining process. 5

[c] Discuss the steps involved in making a mould. 4

8 Write short notes on any two of the following while discussing their types and basic operation performed on them. 2x7=14

[a] Lathe

[b] Shaper

[c] Planer

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SECOND SEMESTER

B.Tech. (CO)

END SEMESTER EXAMINATION **MAY-2012**

CO-116 COMPUTER PROGRAMMING FUNDAMENTALS

Time: 3:00 Hours *Max. Marks : 70*

Note : Answer any *FIVE* questions.
Assume suitable missing data, if any.

1[a] What will be output of the following code?

```
void main ( )
{int i = 0, a[3];
  a[i]=i++;
  printf ("%d", a[i]);
}
```

2

[b] How many keywords are there in C and C++? List any four C language keywords and any four C++ keywords with their purpose. 6

[c] Write a program to create an array of 10 elements. Create a function to accept array and return sum of all the elements of the array. 6

2[a] Explain the difference between function definition & function declaration. Give suitable examples. 6

[b] Explain the following

(i) Algorithm
(ii) Flowchart
(iii) High level language
(iv) Low level language 8

3[a] Identify the following tokens, justify

(i) 53U (ii) A53 (iii) '53' (iv) A.53 (v) 053
(vi) 53e0.2 (vii) "Hello53" (viii) '5'. 8

[b] Write a program to compare two strings without using strcmp( ) function. 6

4[a] Write a program in C to open a file for reading & writing. Convent all lower cases to upper cases then write the same in a new file. 8

[b] What do you mean by binding of data and functions? Give example. 4

[c] for (i =1; i<10; i++)
{if (4<i<6)
{printf("%d", i);}
}
What will be the output of the above program. 2

5[a] Write a program to illustrate the function overloading in C++. 6

[b] What is the purpose of constructors and destructors? Can arguments be passed to a constructor? Explain. 4

[c] Create a class to show the above constructors and destructors. 4

[a] Differentiate between break and continue statements with suitable example. 4

[b] Explain any four unary operators in detail. 4

[c] List & explain any 5 operations which can be carried out on pointer variables, with the help of suitable examples. 6

7 Write short notes (*any Four*): 14

[a] Inheritance
[b] Macros
[c] Multi Dimensional Array
[d] Structures in C
[e] Formal & actual arguments
[f] Passing pointers to function