Total No. of Pages 2

Roll No. 0719

SECOND SEMESTER

B.Tech. (ALL)

MID SEMESTER EXAMINATION **MARCH-2012**

AP-113 APPLIED PHYSICS-II

Time: 1 Hour 30 Minutes *Max. Marks : 20*

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

1[a] An electron has a de Broglie wavelength of 2.00×10^{-12}m. Find its kinetic energy and the phase and group velocities of its de Broglie waves. Rest mass of the electron is $0.511\frac{MeV}{C^2}$. 2

[b] X-rays of wavelength 10.0 pm are scattered from a target (i) find the wavelength of the x-rays scattered through 45° (ii) find the maximum wavelength present in the scattered x-rays (iii) find the maximum kinetic energy of the recoil electrons. 2

[c] An electron and a positron are moving side by side in the +re direction at 0.500 C when they annihilate each other. Two photons are produced that move along the x-axis. What is the energy of each photon? 2

2[a] Show that the operations $\hat{x}$ and $\hat{p}_x$ do not commute. Get the commutator $[\hat{x}\,\hat{p}_x]$ and explain its physical significance. 1

[b] Which of the following wave functions can not be solutions of Schrodinger's equation for all values of x? Why not?

(i) $\psi = A\tan x$ (ii) $\psi = Ae^{x^2}$. 1

[c] Write the energy eigen values and energy eigen function for a particle trapped in an infinite potential box of width L. Draw the first three energy eigen function for (i) infinite potential box of width L and (ii) finite potential box of width L. Compare the two. 3

3[a] Define poynting vector and explain its significance. The electric field vector for an electromagnetic field traveling in vacuum is given by

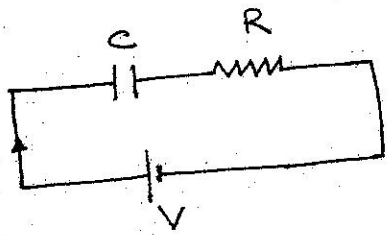
$$\vec{E} = E_0 Cos(kz - wt)\hat{i}$$

Calculate the poynting vector for the wave and show that its magnitude is equal to the energy density of the wave time the velocity of light. 3

[b] Write down and derive the wave equation for propagation of electric field $\vec{E}$ and magnetic field $\vec{B}$ in free space. 2

4[a] Describe physical significance of the displacement current considering the example of current flow through a capacitor. 2

[b] A 50 pf parallel plate capacitor is getting charged at such a rate that its voltage is increasing at 300V/s.



The plates are circular with a radius of 10 cm. Calculate displacement current density and displacement current. 2

DTU/11/0719

Total No. of Pages 1 *Roll No. .....*

SECOND SEMESTER **B.Tech. (EN)**

MID SEMESTER EXAMINATION ***MARCH-2012***

EN-112 ENVIRONMENTAL SCIENCE

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Answer ***ALL*** questions.
All questions carry equal marks.
Assume suitable missing data, if any.

1 Briefly explain the origin and evolution of earth.

2 Describe the various layers and composition of lithosphere.

3 Explain carbon cycle and draw a neat labeled diagram of it.

4 What do you mean by energy flow in an ecosystem? Describe the models of energy flow.

5 Discuss the types of desert ecosystem.

Total No. of Pages 2 BTU/11/0719 *Roll No. .....*

SECOND SEMESTER **B.Tech. (ALL)**

MID SEMESTER EXAMINATION ***MARCH-2012***

AM-111 MATHEMATICS II

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

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

1[a] Define rank of a matrix. Find the rank of the matrix.

$$A = \begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$$

[b] Show that the matrix $A = \begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ is diagonalizable. Obtain the diagonalizing matrix P.

[c] State Cayley Hamilton theorem. Verify this theorem for the matrix $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and hence find its inverse. 7

2[a] Solve the following differential equations:

(i) $\frac{d^2y}{dx^2} + a^2y = secax$

(ii) $\frac{d^2y}{dx^2} - 4y = xsinhx$

[b] Solve $x^2\frac{d^2y}{dx^2} + 4x\frac{dy}{dx} + 2y = e^x$

[c] Solve the following system of differential equations

$\frac{dx}{dt} + 5x - 2y = t$

$\frac{dy}{dt} + 2x + y = 0,$ $x = y = 0$ *when* $t = 0$.

6

3[a] Solve in series the differential equation

$$\frac{d^2y}{dx^2} + xy = 0$$

[b] Obtain the series solution of the equation

$$x(1-x)\frac{d^2y}{dx^2} - (1+3x)\frac{dy}{dx} - y = 0$$

[c] Obtain the series solution of the equation

$$xy'' + y' + xy = 0$$

7

0719

Total No. of Pages 1 *Roll No. .....*

SECOND SEMESTER **B.Tech. (GROUP-A)**

MID SEMESTER EXAMINATION ***MARCH-2012***

COE-116 PROGRAMMING FUNDAMENTALS

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

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

1 Explain the following: 4
[a] Algorithms & Flowcharts
[b] Input & Output Statements

2 Explain the following with syntax, flow chart and relevant coding: 4
[a] The do-while statement
[b] The if-else statement

3 What do you understand by multidimensional arrays? Write a computer program which illustrates how a two dimensional array can be read and how the value stored in the array can be displayed on screen. 4

4 Distinguish between the structure and union. Write a program to find the size of the structure & the union and number of bytes reserved for them. 4

5 Write short notes on any ***TWO*** of the following:
[a] Programming Languages
[d] Coding Style
[c] Subprograms 4

0719

Total No. of Pages 2 *Roll No. .....*

SECOND SEMESTER **B.Tech. (GROUP-A)**

MID SEMESTER EXAMINATION ***MARCH-2012***

AP/AC-114 ENGINEERING MATERIALS

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

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

PART-A

1 Draw:
(i) (1 0 1) plane
(ii) (1 $\bar{2}$ 1) for simple cubic crystal structure. **2**

2 Determine the Miller indices of a plane that makes an intercepts of 2Å, 3Å, and 4Å on the coordinate axis of an orthorhombic crystal structure with a:b:c = 4: 3: 2. **2**

3 Explain briefly hydrogen bonding. The enthalphy of fusion of ice is 6.02 KJ mol^{-1}. Estimate the fraction of hydrogen bonds that are broken when ice malts. (Given: Hydrogen Bond energy 20.5 KJ/mol^{-1}). **2**

4 What do you meant by 'Fermi Energy-Level in metals. Discuss about Fermi Energy at T = 0°K & T > 0°K. **2**

5 Find the relaxation time of conduction electrons in a metal of resistivity 1.54×10^{-8} ohm-m. If the metal has 5.8×10^{28} conduction electrons per m^3. **2**

6 Calculate the inter planer spacing for a (321) plane in a simple cubic lattice whose lattice constant is 4.2×10^{-8} cm. **2**

PART-B

1[a] What is alloy steel? Discuss heat resisting steels in detail. **2½**

[b] What is aluminium bronze? Discuss its composition, characteristics and uses. 2½

[c] Differentiate between continuous phase and reinforcements. Also give suitable examples. 2½

[d] Discuss environmental effects on composite materials in detail. 2½

OR

2[a] What are the characteristics of refractories? Discuss about the dolomite bricks in detail. 2½

[b] Differentiate between earthenwares and stonewares. Discuss the importance of these materials in detail. 2½

[c] What is polypyrrole? How can you prepare it? Discuss its technological applications also. 2½

[d] How the conductivity is correlated with band gap in conjugated polymers? Discuss it by considering polyacetyline and polyparaphenylene polymers. 2½

Total No. of Pages 1 *Roll No.* 0719

SECOND SEMESTER **B.Tech. (Group A)**

MID SEMESTER EXAMINATION ***MARCH-2012***

ME-115 BASIC MECHANICAL ENGINEERING

Time: 1 Hour 30 Minutes ***Max. Marks : 20***

Note : Question No. ***ONE*** is compulsory.
Answer any ***FIVE*** parts questions in Question No.2.
Assume suitable missing data, if any.

1[a] A gas flows steadily through a rotary compressor The gas enters the compressor at a temperature of 16°C, a pressure of 100KPa and an enthalpy of 391.2 KJ/kg. The gas leaves the compressor at a temperature of 245°C, a pressure of 0.6MPa and an enthalpy of 534.5KJ/kg. Heat transfer is negligible. Evaluate (i) the external work done per unit mass of gas assuming the gas velocities at entry and exit to be negligible (ii) the external work done per unit mass of gas when the gas velocities at entry is 80 m/s and that at exit is 160 m/s. 4

[b] Differentiate between (i) microscopic view point and macroscopic view point(ii) Reversible process and Irreversible process. 2

[c] Explain the following (i) concept of contimum (ii) point function and path function (iii) gauge pressure and (iv) Thermodynamic equilibrium. 2

[d] Show from Ist law of thermodynamics that work in an adiabatic process is given by :-

$$W_{1-2} = \frac{P_1V_1 - P_2V_2}{\gamma - 1}$$ 2

OR

[e] Show from Ist law of thermodynamics the work in a polytropic process is given by:-

$$W_{1-2} = \frac{P_1V_1 - P_2V_2}{n - 1}$$ 2

2[a] Discuss types of welding. Also explain welding defects. 2

[b] Name different pattern materials and pattern allowances. What are important moulding materials? 2

[c] Explain different types of flames with their applications. 2

[d] Explain the different elements of gating system. 2

[e] State that principle and working of metal arc welding? 2

[f] Explain the casting process and various casting defects. 2