Reg. No. : .....

D 628 Q.P. Code : [D 07 PPH 06]

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, DECEMBER 2009.

Second Year

Physics

CONDENSED MATTER PHYSICS

Time : Three hours Maximum : 100 marks

Answer any FIVE questions. (5 × 20 = 100)

1. (a) Derive the reciprocal Lattices to BCC and FCC.

   (b) Explain the rotating crystal method of studying crystal structure.

2. (a) Explain the theory of Schottky and Frenkel defects.

   (b) Explain stress around an edge dislocation.

3. (a) Derive the London equation.

(b) Explain the domain for ferromagnetism.

4. (a) (i) Mention the four stages of kinetics of phase change.

(ii) Derive the Gibbs Thomson equation for vapour and solution.

(b) Explain the BCF theory of solution.

5. (a) Explain the zone melting techniques. What are the reasons for choosing this technique?

(b) (i) Derive the expression of super saturation.

(ii) Explain the solubility with diagram.

(iii) How is the solubility measured of KDP and ADP?

6. (a) (i) Deduce the Butler-Volmer equation.

(ii) Deduce the Nernst relation.

(b) (i) What is the principle of gel growth? Explain its various types.

(ii) Explain the double diffusion methods.

7. (a) Explain the importance of gel technique.

(b) What is autoclove? Explain its different types.

8. (a) Explain briefly the BCS theory for super conductors.

(b) Discuss the quantum theory of para magnetism.

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6. Apply Graffe's root squaring method to find the roots of the following equations.

(a) $x^3 - 6x^2 + 11x - 6 = 0$

(b) $x^3 - 4x^2 + 5x - 2 = 0$

(c) $x^3 - x^2 - x - 2 = 0$

Do the calculations for 5 iterations. $(3 \times 6\frac{2}{3} = 20)$

7. (a) (i) What is a conditional statement? Explain.

(ii) List the three different structures of if statement in MATLAB. Discuss them in detail. (2 + 15 = 17)

(b) Explain in brief the "NESTED LOOPS". (3)

8. (a) Solve the following equations by Gauss elimination method.

(i)
$$10x_1 - x_2 + 2x_3 = 4$$
$$x_1 + 10x_2 - x_3 = 3$$
$$2x_1 + 3x_2 + 20x_3 = 7$$

(ii)
$$x_1 + x_2 + x_3 = 6$$
$$3x_1 + x_2 + 4x_3 = 20$$
$$2x_1 + x_2 + 3x_3 = 13$$

$(2 \times 7 = 14)$

(b) Using Euler's method, solve the differential equation $y' = -y$ with $y(0) = 1$. (6)

Reg. No. : .....

D 630 **Q.P. Code : [D 07 PPH 08]**

(For the candidates admitted from 2007 onwards)

M.Sc. DEGREE EXAMINATION, DECEMBER 2009.

Second Year

Physics

COMPUTATIONAL METHODS AND PROGRAMMING

Time : Three hours Maximum : 100 marks

Answer any FIVE of the following.

All questions carry equal marks.

$(5 \times 20 = 100)$

1. (a) (i) Using Newton-Raphson's method, find correct to four decimal places, the root between 0 and 1 of the equation $x^3 - 6x + 4 = 0$. (5)

(ii) Using Newton-Raphson's method, establish the formula $x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]$ to calculate the square root of N. Hence Find the square root of 5 correct to four decimal places. (5)

(b) Using Runge-Kutta fourth order, solve the system of differential equations,

$\frac{dy}{dx} = xz + 1$, $\frac{dz}{dx} = -xy$ for $x = 0(.3).9$. Give initial values are $x = 0, y = 0$ and $z = 1$. (10)

2. (a) (i) Classify the following equations as hyperbolic, parabolic or elliptic.

(1) $f_{xx} + 2f_{xy} + f_{yy} = 0$

(2) $f_{xy} - f_x = 0$

(3) $x^2 f_{xx} + (1 - y^2) f_{yy} = 0$. (5)

(b) Derive the Crank-Nicolson formula to solve the parabolic type of partial differential equations. Use it to solve, the following equation, $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ with the conditions :

$u(x,0) = u(0,t) = 0$ and $u(1,t) = t$ with

(i) $k = \frac{1}{8}$ and $h = \frac{1}{2}$

(ii) $k = \frac{1}{8}$ and $h = \frac{1}{4}$ and

(iii) $k = \frac{1}{16}$ and $h = \frac{1}{4}$. (15)

3. Discuss the following with respect to MATLAB.

(a) DISPLAY FORMATS

(b) ELEMENTARY MATH FUNCTIONS and ROUNDING FUNCTIONS.

(c) Rules about variable names

(d) Predefined and global variables. (4 × 5 = 20)

4. (a) Define a function file. List its characteristics. (5)

(b) Explain the following with respect to a function file.

(i) Structure of a function file. (3)

(ii) Function definition line. (3)

(iii) Input and output arguments. (4)

(iv) Inline functions. (5)

5. (a) Explain the following in MATLAB as applied to 3-D graphics.

(i) Line plots

(ii) Making mesh and surface plots

(iii) Creating a grid in the x-y plane.

(iv) Plots with special graphics. (4 × 4 = 16)

(b) Explain the view command in 3-D graphics in MATLAB. (4)