COMPUTATIONAL METHODS IN PHYSICS-II (SEMESTER - 2)

CS/INT.PBIR (PHY)/SEM-2/PHY-205/09

1. .....
Signature of Invigilator

2. .....
Signature of the Officer-in-Charge

Reg. No. | | | | | | | | | | | | | | |

Roll No. of the Candidate | | | | | | | | | | | | | | |

CS/INT.PBIR (PHY)/SEM-2/PHY-205/09

ENGINEERING & MANAGEMENT EXAMINATIONS, MAY – 2009

COMPUTATIONAL METHODS IN PHYSICS-II (SEMESTER - 2)

Time : 3 Hours] [Full Marks : 50

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.
2. You have to answer the questions in the space provided marked 'Answer Sheet'. Write on both sides of the paper.
3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.
4. Read the instructions given inside carefully before answering.
5. You should not forget to write the corresponding question numbers while answering.
6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.
7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**
8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.
9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

FOR OFFICE USE / EVALUATION ONLY

Marks Obtained

Question Number											***Total Marks***	***Examiner's Signature***
Marks Obtained												

.....
Head-Examiner/Co-Ordinator/Scrutineer

30008 (27/05)

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ENGINEERING & MANAGEMENT EXAMINATIONS, MAY – 2009

COMPUTATIONAL METHODS IN PHYSICS-II

SEMESTER - 2

Time : 3 Hours] [Full Marks : 50

Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions.

Each question carries 10 marks.

1. Use the Bisection method to find the square root of 7.

2. The Peng-Robinson equation of state

$$P = \frac{RT}{V - b} - \frac{a}{V(V + b) + b(V - b)}$$

is a two-parameter extension of the ideal gas law. Find the volume of 1 mole of a gas at $P = 10^4$ kPa and $T = 340$ K, take as the parameter values

$a = 364$ m^6 kPa/(kg mole)^2 , $b = 0{\cdot}03$ m^3 /kg mole and $R = 1{\cdot}618$.

Use $V = 0{\cdot}055$ m^3 /kg mole as an initial estimate (from the ideal gas law).

3. Solve, using basic Gaussian elimination

$$A = \begin{bmatrix} 2 & 0 & -2 \\ 3 & -4 & -4 \\ -2 & 2 & -1 \end{bmatrix}, \quad b = \begin{bmatrix} -10 \\ -8 \\ 3 \end{bmatrix}$$

the linear system $Ax = b$.

4. Find the LU factorization of the given matrix using (i) Doolittle form, (ii) Cholesky form :

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 20 & 26 \\ 3 & 26 & 70 \end{bmatrix}.$$

5. Find the interpolating polynomial in Lagrange form :

$x = [\ 1 \quad 2 \quad 3\ ]$

$y = [\ 1 \quad 4 \quad 8\ ]$.

6. Solve by using Runge-Kutta method $y' = yx^{-2}$ with $y(1) = 2$ on $[1, 2]$.

The exact solution is $y = 2\,exp\left(\frac{(x-1)}{x}\right)$.

END