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SB-2709

M. Sc. (Physics) (Sem. II) Examination

March / April – 2011

Physics : Paper - PH-424

(Numerical Analysis & Computer Programming)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Physics) (Sem. II)**

Name of the Subject :

☛ **Physics : Paper-PH-424**

☛ Subject Code No. : **2 7 0 9** ☛ Section No. (1, 2,.....) : **Nil**

Seat No. :

Student's Signature

(2) Attempt all the **five** questions.

(3) Symbols used have their usual meaning.

(4) Figures to the **right** indicate marks.

1 Attempt any **two** questions :

(a) (i) Explain Picard's method for solution of ordinary differential equations. **3**

(ii) Given : **4**

$dy/dx=(y+x)/(y-x)$ and $y(0)=1$

Find y at x=0.2 taking h=0.2 and using the fourth order Runge-Kutta method.

(b) (i) Write the general quadrature formula for equidistant ordinates and hence derive Trapezoidal rule for numerical integration. **3**

(ii) Compute the value of $\int_1^5 (x^4+1)dx$ using Simpson's $(1/3^{rd})$ rule and taking h=1. Also estimate the inherent error in your calculation. **4**

(c) (i) Derive the Cramer's rule for solution of simultaneous linear equations. **3**

(ii) Find all the eigen values and eigen vectors of the matrix given below using Jacobi method : **4**

$$\begin{bmatrix} 1 & \sqrt{2} & 2 \\ \sqrt{2} & 3 & \sqrt{2} \\ 2 & \sqrt{2} & 1 \end{bmatrix}.$$

2 Attempt any two questions :

(a) (i) Explain the importance of numerical analysis in solving problems in physics with the help of some examples. **3**

(ii) Using the least square fit method, find the straight line y=mx+c that fits the following data : **4**

x	0.5	1.0	1.5	2.0	2.5	3.0
y	15	17	19	14	10	7

.

(b) (i) What is meant by an algorithm and a flow-chart ? What are the various symbols used in drawing a flow-chart ? **3**

(ii) Find y from the equations : **4**

$$x - 2y + 3z + 4t = 9/2$$

$$3x - y + 2z + 5t = 19/2$$

$$2x + 4y - 5z + t = 15$$

$$4x + 2y - z + 3t = 12.$$

Using Cramer's rule and Pivotal method for evaluating the determinants.

(c) (i) Differentiate between a higher level and a lower level language. **3**

(ii) Draw a flowchart for finding the sum of the digits of a five digit positive integer number. **4**

3 Attempt any **two** questions :

(a) (i) Explain how input/output from a file is obtained in FORTRAN. **3**

(ii) What are the rules for naming integer variable names in FORTRAN ? **2**

(iii) Write the FORTRAN expression corresponding to the following mathematical expression **2**

$$2.5\log_{10} X + \left| X^2 + Y^2 \right| + \sqrt{2XY}.$$

(b) (i) What is the difference between GOTO and computed GOTO statements in FORTRAN ? **2**

(ii) Explain the structure of DO statement in FORTRAN. **2**

(iii) Find all the errors in the following : **3**

```
READ (*,*) X1 Y1, X2, Y2
RS=((X1-Y1)+(X2-Y2)
DISTANCE=SQRT(RS)
WRITE (*,10) DISTANCE
10 FORMAT (1X, 'DISTANCE=', F8.7)
END
STOP
```

(c) (i) What are the differences between Logical IF, Arithmetic IF, and Computed GOTO statements in FORTRAN ? **3**

(ii) What is the difference between a function statement and a function subprogram in FORTRAN ? **2**

(iii) Write the mathematical expression corresponding to the following FORTRAN arithmetic expression : **2**

A*B/(C+D*K/M+K)+A.

4 Attempt any **two** questions.

(a) (i) Explain the use of following in C-program : **3**

(a) continue

(b) fscanf

(c) break

(ii) Explain the purpose of each statement of the following program and write its output. **4**

```
main()
{
int a[5];
int i;
for(i=0;i<5; ++i) scanf("%d", &a[i]);
for(i=4;i> =0;--i)printf("%d",a[i]);
}
```

(b) (i) What are the differences between for and do... while statements ? Explain with examples. **4**

(ii) Evaluate each of the following C-expressions : **3**

```
int i=2, j=4, k=1;
```

(A) k++%--j (B) i*=k=++j+i

(c) (i) Explain the use of pointer data type with an example. Which value does a pointer store ? **3**

(ii) Using switch, write a C program to convert years into days, hours, minutes and seconds (i.e. take four cases). **4**

5 Attempt any **two** questions :

(a) (i) Write the C arithmetic expression corresponding to the following mathematical expression : **2**

(A) $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (B) $x^{-1/3} - y^{-2e^{-z}}$

(ii) Write a FORTRAN program to find the root of the equation $x^2 - 30 = 0$ correct up to 5 places of decimal using Newton-Raphson method when the initial approximation x_0 is given. **5**

(b) (i) Explain the use of OPEN and CLOSE statement in FORTRAN. **2**

(ii) Write a C program to evaluate $\int_2^6 \frac{1}{x} dx$ using Simpson's 1/3 rule. **5**

(c) (i) What is meant by prototype statement in C ? **2**

(ii) Write a FORTRAN program to check whether a given number is a prime number or not. **5**