

PG Even Semester (CBCS) Exam., May—2018

PHYSICS

(2nd Semester)

Course No. : PHYCC-204

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks
for the questions

Candidates are to answer *either* OPTION—A
or OPTION—B or OPTION—C

OPTION—A

Course No. : PHYCC-204A

(OUR ATMOSPHERE)

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. What is air and what are its different components? Discuss the structure of earth's atmosphere in detail. 5+9=14

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(Turn Over)

2. (a) What are the different factors governing the temperature of the atmosphere? Draw a schematic diagram showing the variation of temperature with geometric altitude. 2+2=4
- (b) What is Ramdas layer? How can one explain the phenomena? 2+3=5
- (c) Discuss the evolution of earth's atmosphere. 5

UNIT—II

3. (a) What is meant by severe weather? What are its different categories according to world meteorological organization? Give two examples from each category. Discuss the formation of a severe weather phenomenon related to high wind speed. 2+2+2+4=10
- (b) Discuss the rainfall distribution pattern over North-East India. 4
4. (a) Discuss four ways to distinguish different types of clouds. 8
- (b) Discuss in detail about precipitation mechanism from a tropical cloud. 6

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(Continued)

(3)

UNIT—III

5. What are climatic zones? How do they form?
Describe the four major climatic zones of
the world. 1+1+12=14
6. Describe the Köppen climate classification
and Trewartha climate classification
schemes. 7+7=14

UNIT—IV

7. Differentiate between weather and climate.
Discuss the regional and seasonal variation
of rainfall over the world. 3+11=14
8. (a) Discuss the mechanism of formation
and development of tropical and
temperate cyclones. 8
- (b) Discuss the effect of rotation and
revolution of earth on its climate. 6

UNIT—V

9. Discuss in detail the causes and
consequences of global warming. 14
10. (a) Discuss the difference between climate
variability and climate change. 4
- (b) Write notes on the following : 5+5=10
- (i) Agroclimatology
- (ii) Urban climatology

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(Turn Over)

(4)

OPTION—B

Course No. : PHYCC-204B

(INSTRUMENTATION)

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Discuss the static characteristics of
an instrument. 8
- (b) Name three types of systematic errors.
Give example for each of them. 6
2. (a) Draw the basic block diagram of an
instrument and explain briefly. 7
- (b) Explain the difference between accuracy
and precision of a measurement. 7

UNIT—II

3. (a) Discuss the different parameters of
electrical transducer. 5
- (b) What is the difference between active
and passive transducers? 3
- (c) Write the working principle of
a thermocouple. 6

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(Continued)

(5)

4. (a) Discuss the working principle of an optoelectronic transducer and state some of its applications. 8
- (b) Write short notes on ultrasonic flowmeter and humidity sensor. 6

UNIT—III

5. (a) Write some of the uses of a potentiometer. What is the advantage of potentiometer over voltmeter? Write down the working principle of potentiometer. 2+2+5=9
- (b) What do you mean by loading effect? What is its relation with the sensitivity of a system? 4+1=5
6. (a) Discuss the construction and working of a cathode-ray oscilloscope. Mention some of the electrical parameters that can be measured by a CRO. 8+2=10
- (b) Write a short note on Q-meter. 4

(6)

UNIT—IV

7. (a) How does FTIR differ from normal IR spectroscopy? What are the main utilities of FTIR? Write down the advantages of FTIR. 2+3+4=9
- (b) Write down the principle of operation of UV-visible spectrometer. 5
8. (a) Discuss with figure, the working principle of a transmission electron microscope (TEM). 8
- (b) Write short notes on photoluminescence and Raman spectroscopy. 6

UNIT—V

9. (a) Describe the construction and working of diffusion pump. 8
- (b) What do you mean by roughing and backing of a system? 2
- (c) Explain briefly the working of cryopump. 4
10. (a) What are the working ranges of Pirani and Penning gauges? How does a Penning gauge work? 2+5=7
- (b) What are the different techniques of leak detection? Discuss one of them. 2+5=7

(7)

OPTION—C

Course No. : PHYCC-204C

**(NUMERICAL ANALYSIS AND
COMPUTER PROGRAMMING)**

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) Describe with the help of a block diagram, the process of numerical computing. 7
- (b) Describe briefly the four characteristics of numerical computing. 7
2. (a) How is assembly language better than machine language? 2
- (b) Describe inherent errors in numerical computing. 5
- (c) Describe three basic control structures used in executing the solution steps. 5
- (d) Discuss in detail truncation errors involved in numerical computing. 2

(8)

UNIT—II

3. (a) What do the following LINUX commands do? 2
- (i) cd ..
- (ii) mkdir
- (iii) cat
- (iv) grep.
- (b) Write a FORTRAN program to find the following series : 5
- $$1 \ x \ x^2 \ \dots \ x^n$$
- (c) Write a FORTRAN program to find the multiplication of two matrices. 7
4. (a) Give two differences between function subprogram and subroutine subprogram. 2
- (b) Using subroutine subprogram, write a FORTRAN program to calculate factorial of a number. 5
- (c) Write a FORTRAN program to arrange a number in an ascending order and display the result in a file named 'ascending. dat'. 7

UNIT—III

- 5. (a) Derive the Newton-Raphson iterative formula

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

for solving $f(x) = 0$. 5

- (b) Find one root of the following equation using fixed point iteration method (up to 4 places decimal) : 5

$$e^x - x - 2 = 0$$

- (c) Write FORTRAN program by which Q. No. 5(b) be realized. 4

- 6. (a) Find all the roots of the following polynomial equation, using Newton-Raphson and synthetic division approach : 7

$$x^2 - 3x - 2 = 0$$

- (b) Write FORTRAN code for the above question. 7

UNIT—IV

- 7. (a) Using basic Gauss elimination method, find the solution of the following simultaneous equations : 7

$$\begin{matrix} 3x & 2y & z & 10 \\ 2x & 3y & 2z & 14 \\ x & 2y & 3z & 14 \end{matrix}$$

- (b) Write FORTRAN code for the above question. 7

- 8. (a) Find the Lagrange's interpolation polynomial which agrees with the following data :

x	1.0	1.1	1.2
cos x	0.5403	0.4536	0.3624

Use it to examine $\cos(1.15)$. 7

- (b) Write FORTRAN code for the above question. 7

UNIT—V

- 9. (a) Applying Simpson's $\frac{1}{3}$ rd rule for $n = 8$, compute the following integral :

$$\int_0^{1/2} \sqrt{\sin(x)} dx$$

Accuracy up to 5 places decimal. 7

- (b) Write FORTRAN code for the above question. 7

10. (a) Using fourth-order Runge-Kutta method, estimate $y(0.4)$, when $y(x) = x^2 - y^2$ with $y(0) = 0$. Assume $h = 0.1$. 7
- (b) Write FORTRAN code for the above question. 7
