

U.G. 5th Semester Examination - 2021**PHYSICS****[PROGRAMME]****Skill Enhancement Course (SEC)**

Course Code : PHYS(G)SEC-T-03(A), (B), (C), (D), (E), (F), (G), (H) & (I)

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate marks.

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

Answer all the questions from Selected Option.

OPTION-A**PHY-G-SEC-T-03(A)****(Renewable Energy and Energy Harvesting)**

1. Answer any **five** of the following questions:

2×5=10

- What do you mean by green house? Enumerate the main types of green houses.
- Give two examples of conventional and non-conventional energy sources.
- What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere?

[Turn over]

- Define solar constant.
- What are the main applications of solar pond?
- What do you mean by fossil fuel?
- What is piezoelectric energy harvesting?
- Define altitude angle.

2. Answer any **two** questions: 5×2=10

- Explain the principle of conservation of solar energy into heat. What are the main components of a flat-plate solar collector? 3+2
- What are the advantages and limitations of renewable energy sources? 5
- What is the principle of solar photovoltaic power generation? Mention the advantages of photovoltaic solar energy conversion. 3+2
- What is the basic principle of ocean thermal energy conversion (OTEC)?
 - Mention the different types of geothermal sources. 3+2

3. Answer any **two** questions. 10×2=20

- Writes short notes on (any **two**):
 - Electromagnetic energy storage
 - Heat extraction method from a solar pond

- iii) Chemical energy storage method. 5+5
- b) What is the difference between biomass and biogas? Give a list of materials used for biogas generation. What are the difficulties in tidal power developments? 2+3+5
- c) Derive the expression for power developed due to wind. What methods are used to overcome the fluctuating power generation of wind mill? 4+6
- d) Writes short notes on (any **two**) : 5+5
- i) Tidal energy
- ii) Thermoelectric generation
- iii) Biomass and biogas

OPTION-B

PHY-G-SEC-T-03(B)

(Basic Instrumentation Skills)

1. Answer any **five** of the following questions: 2×5=10
- a) Write down the unit of 'capacitance' and 'electric field'.
- b) What is the significance of basic RLC bridge?

- c) What do you mean by the term "accuracy"?
- d) Mention the types of "voltmeter".
- e) Write down the full form of "CRO" and "CRT".
- f) Write down the major advantages of digital instruments over analog instruments.
- g) How do you measure the capacitance of a capacitor by using multimeter?
- h) What do you mean by resolution of a digital multimeter?

2. Answer any **two** from the following questions:

$$5 \times 2 = 10$$

- a) Discuss the working principle of a frequency counter.
- b) Write down the working principle of Q-meter.
- c) Write short note on electronic voltmeter.
- d) Write down the steps for measuring ac voltage and resistance of a wire by a conventional multimeter.

3. Answer any **two** from the following questions:

$$10 \times 2 = 20$$

- a) What must be done to obtain a steady oscillogram? Why a fluorescent screen is used in CRT? How time base is obtained in a CRO?

$$(3+3)+4$$

- b) Draw a block diagram of a general purpose CRO and indicates its each components. Define the type of errors arise in a measurement. (3+3)+4
- c) Write short note on (i) Digital LCR bridge and (ii)dc millivoltmeter. 5+5
- d) Draw a neat diagram of a CRT and discuss the significance of its each component. Write down the advantages of electronic voltmeter over conventional multimeter for measuring voltage. (3+3)+4

OPTION-C

PHY-G-SEC-T-03(C)

(Computational Physics Skills)

GROUP-A

1. Answer any **five** of the following questions: $2 \times 5 = 10$
- a) Who is called the father of the computer? What is full form of RAM?
- b) Explain the common approaches used in designing an algorithm.
- c) Write the common programming languages which are used for science?

- d) What is the minimum number of disk partitions required to install Linux? How to copy file in Linux?
- e) What is the purpose of a header file? Is the use of header file absolutely necessary?
- f) Explain the syntax of GOTO statement.
- g) What is the difference between DO, DO WHILE and IF () GOTO Loops?
- h) What does the function REAL(x) do?
- i) What is the difference between a Subprogram and a Subroutine?
- j) What is LaTeX?
- k) How do you compile a LaTeX file? How do you change the type style in LaTeX?

GROUP-B

2. Answer any **two** questions: $5 \times 2 = 10$
- a) Why do we use flowcharts? What are the five properties of algorithm? Write an algorithm to read two numbers and find their sum. $1 + 2 + 2$
- b) Write an algorithm to determine a student's final grade and indicate whether it is passing or failing. The final grade is calculated as the average of four marks. 5

- c) Design an algorithm which generates even numbers between 1000 and 2000 and then prints them in the standard output. It should also print total sum. 5
- d) Design an algorithm for plotting of a trajectory of a projectile thrown at an angle θ with the horizontal. 5
- e) Write a C program to find the integral using Simpson's one-third rule

$$\int_0^{0.8} \log x + \sin(2x) + x^2 dx \quad 5$$

- f) Write an algorithm and draw a flowchart that will calculate the roots of a quadratic equation:
 $ax^2 + bx + c = 0$ 5
- g) Write a program to solve and plot the output for visualization of the following differential equation:

$$6x^2 - 17x + 12 = 0 \quad 5$$

GROUP-C

- 3. Answer any **two** questions: 10×2=20
 - a) What is difference between algorithm and pseudo code? Explain steps involved in drawing of a flowchart. Write an algorithm that reads three numbers and prints the value of the largest number. Also draw the flowchart for it.

$$2+3+2+3$$

- b) Write algorithm to this problem: Ramshevak goes to market for buying some fruits and vegetables. He is having a currency of Rs.500 with him for marketing. From a shop he purchases 2.0 kg Apple priced Rs.50.0 per kg, 1.5 kg Mango priced Rs.35.0 per kg, 2.5 kg Potato priced Rs.10.0 per kg, and 1.0 kg Tomato priced Rs.15 per kg. He gives the currency of Rs.500 to the shopkeeper.

Find out the amount shopkeeper will return to Ramshevak and also tell the total item purchased. Is there any difference between UNIX and LINUX?

Write a C program to draw a random sample of size n from gamma distribution with parameter θ . Also find its mean and variance.

$$4+2+4$$

- c) What is constant? Explain various types of constant in FORTRAN. 2+8
- d) Write a program to find a transpose of a matrix. Write short notes on: (i) Call statement (ii) Save statement. 4+3+3
- e) Type the 1st page of this question paper in your answer script using LaTeX command.

OPTION-D

PHY-G-SEC-T-03(D)

(Applied Optics)

GROUP-A

1. Answer any **five** of the following questions:

$2 \times 5 = 10$

- a) What is the difference between spontaneous and stimulated emission of radiation?
- b) If one dimensional field distribution of an object is represented by the function given :
 $f(x) = \cos(3.14x) + \cos(6.28x) + \cos(9.42x)$;
Then determine different spatial frequencies contained by the object.
- c) What do you mean by Fourier transforming property of a thin lens?
- d) What do you mean by mono-mode and multi-mode optical fibre?
- e) Differentiate between transmission and reflection type holograms.
- f) Write down two applications of optical fibers.
- g) What do you mean by splice loss in optical fibre?
- h) Give one example for each of the following: solid-state and Gas laser.

GROUP-B

2. Answer any **two** questions: $5 \times 2 = 10$

- a) With the help of a suitable diagram explain the action of a He-Ne laser. 5
- b) Explain briefly how emission and absorption spectra can be measured using Fourier Transform Spectroscopy (FTS). 5
- c) What are the main advantages and disadvantages of communication using optical fibre compared to other modes of communication? 5
- d) Write down the full form of LDR. With the help of suitable circuit diagrams draw the characteristics of an LDR. Write down one use of an LDR. $1+3+1=5$

GROUP-C

3. Answer any **two** questions: $10 \times 2 = 20$

- a) Explain briefly recording and reconstruction process of holograms. Write down the names of different types of holograms. Write down the application of holography in interferometry. $4+2+4=10$
- b) Discuss the concept of spatial frequency filtering. What is fibre optic sensor? Write down the full form of NMR. Write a short note on Fibre Bragg Grating. $2+2+1+5=10$

- c) Explain the terms 'optical pumping' and 'population inversion' in a laser system. With the help of a suitable diagram explain how population inversion is achieved in a two level laser system. Establish the relations between A and B coefficients. $2+3+5=10$
- d) With the help of suitable diagram show the ray paths in graded and step index fibres. What do you mean by acceptance angle and numerical aperture of an optical fibre? Find the numerical aperture of a step index fibre when the refractive index of the core is 1.50 and that of the material used for cladding is 1.48. $2+2+6=10$

OPTION-E

PHY-G-SEC-T-03(E)

(Electrical Circuits & Network Skills)

1. Answer any **five** of the following questions: $2 \times 5 = 10$
- a) Define (i) Apparent Power (ii) Power factor.
- b) Give one example of electrical components which obey and disobey Ohm's law.
- c) Draw symbol for current controlled voltage source.

- d) Write the condition to transfer Maximum Power to the load in a.c circuits.
- e) Write the steps to convert a given current source into equivalent voltage source.
- f) Write the formula for star to delta and delta to star conversion.
- g) Write down the advantages of three-phase ac source.
- h) What are the three types of wiring connection?
2. Answer any **two** questions: $5 \times 2 = 10$
- a) Describe different types of circuit breakers and their working principle. 5
- b) What are the types of cables used for transmission and distribution systems? What are the salient features of the insulation materials used for underground cables? $2+3$
- c) What are the basic concepts of household wiring and explain? 5
- d) An alternating voltage of 250 V, 50 Hz is applied to a coil which takes 5 A of current. The power absorbed by the circuit is 1 KW. Calculate the resistance and inductance of the coil. 5
3. Answer any **two** questions: $10 \times 2 = 20$
- a) What is the basic multimeter used to measure? What are the two types of multimeters? What

are the parts of a multimeter? How can one measure an unknown resistance, voltage and test a continuity by a multimeter? 1+2+2+5

- b) With a neat circuit diagram, explain the construction and principle of operation of DC Motor. Write short notes on the types of dc generator. 5+5
- c) What are the various types of drawing used for electrical wiring? Explain in detail. What is the series resonance? Determine the power factor of a RLC series circuit with $R=5$ ohm, $X_L=8\Omega$ and $X_C=12\Omega$. 5+2+3
- d) Define Apparent power and Power factor. What are the materials used for wiring? With a neat circuit diagram explain the principle of operation of a full wave rectifier. 2+3+5
