U.G. 5th Semester Examination - 2020
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)

(Technical Drawing)

GROUP–A

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

    $2\times5=10$

    a) What are the uses of drafting instruments? Give examples.

    b) What are the uses of Auto CAD?

    c) Name any two software related to CAD.

    d) R.F. of a scale is 1/6; length of drawing is 4 cm. What is the actual length?

    e) Define an ellipse.

    f) Write down two applications of holograms.

    g) What do you mean by splice loss in optical fibre?

GROUP-B

2. Answer any **two** questions: $5\times2=10$

    a) Write the principles of projection.   5

    b) Draw an equilateral triangle of 60 mm side and inscribe a circle in it. Draw the projection of the figure when its plane is inclined at an angle of 45° to the horizontal plane.   5

    c) Explain different methods used for drawing ellipse in auto CAD.   5

GROUP-C

3. Answer any **two** questions: $10\times2=10$

    a) Construct an ellipse when the distance of focus from directrix is equal to 60 mm and eccentricity is 2/3. Name three types of conic section.   8+2

b) Draw the isometric view of a rhombus. What is polyhedral? What is a prism? 6+2+2

c) The ends of a line AB are on the same projector. The end A is 24 mm below H.P. and 9.6 mm behind V.P. The end B is 44 mm above H.P. and 36 mm in front of V.P. Determine the true length of AB and inclinations with the two planes. 10

OPTION-B

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

(Renewable Energy & Energy Harvesting)

GROUP–A

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

$$2 \times 5 = 10$$

a) What is fossil fuel?

b) Write down the name of different types of renewable energy resources?

c) What is osmotic power?

d) Define the term solar constant?

e) What is piezoelectric energy harvesting?

f) What is solar cell?

g) Mention four examples of non-renewable energy resources?

h) What is the main disadvantage of hydro power?

GROUP-B

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

a) The sun is the ultimate source of energy. Explain.

b) Write down the advantage and disadvantage of wind energy.

c) Mention briefly the environment impact of hydropower source.

d) What are the advantages and disadvantages of photovoltaic solar energy conversion?

GROUP-C

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

a) Explain the different applications of renewable energy?

b) Write short notes on:
   i) Geothermal energy
   ii) Ocean energy.

c) Describe the precautions to establish nuclear power plant and mention the advantages of nuclear energy.

d) Write short notes on:
   i) Wind energy
   ii) Biomass.

OPTION-C

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

(Radiation Safety)

GROUP–A

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

2×5=10

a) What are the common radiation sources in nature and man-made cases?

b) Define isotopes. Give examples.

c) What do you mean by Auger electron?

d) Explain the term MRI.

e) State any two properties of β-rays.

f) Give any two similarities between liquid drop and the nucleus.

g) What is a GM counter?

h) Define the term activity of a radioactive sample. State its SI unit.

GROUP-B

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

a) Explain the meaning of nuclear waste. State the different ways to manage it. 2+3

b) What is characteristic X-ray? Differentiate between characteristic and continuous X-rays. 2+3

c) What is meant by stable isotope? How is it used? Give examples. 1+2+2

d) What is photoelectric effect? Write Einstein's photo electric equation. Obtain the relation between stopping potential and frequency of incident photon. 1+2+2

GROUP-C

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

a) What are the principles of ICRP and how does it work? 10

b) Write Geiger-Nuttal law. Explain the theory of α-decay. 4+6

c) Explain the phenomenon of f nuclear fusion. Give example. What are the necessary conditions for nuclear fusion? 3+2+5

d) Discuss the semi-empirical formula for the nuclear binding energy. Explain different terms in it. 10

OPTION-D

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

(Electrical Circuits and Network Skills)

GROUP–A

1. Answer any **five** of the following questions: 2×5=10

a) State Kirchoff's voltage law.

b) Define power factor.

c) Give one example each of electrical components which obey and disobey Ohm's law.

d) Define efficiency of a motor.

e) What is PIV of a diode?

f) Define form factor of AC waveform.

g) Draw electrical symbol of a zener diode and variable resistor.

h) Define rectification efficiency of a rectifier circuit.

GROUP-B

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

a) Establish relation between values of resistors of star and delta connections. 5

b) Explain the steps for converting practical voltage source into practical current source.

5

c) State and explain:
   i) Maximum power transfer
   ii) Reciprocity theorem   3+2

d) If $Z1 = 3 + j7$ and $Z2 = 12 - j16$ are connected in parallel. Find the equivalent impedance of combination.   5

GROUP-C

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

a) Explain the working principle of a DC motor.
   Three resistances $32\,\Omega$, $40\,\Omega$, $48\,\Omega$ are connected in star circuit. Determine its equivalent delta circuit.   5+5

b) Compare MCB and RCCB. Write down the advantages of these circuit breakers over the fuse element.
   Determine Bandwidth and Quality factor (Q) for the series LCR circuit.   (3+2)+5

c) Compare series and parallel LCR circuits.
   A coil has resistance of $4\,\Omega$ and an inductance of 9.55 mH. Calculate
   i) Reactance

ii) The impedance
iii) The current taken from 240 V, 50 Hz supply.   5+5

d) Explain the basic principle and working of three phase motor.
   Define speed of AC motor. What does it depend on? What are the advantages of polyphase motor?   5+(1+2+2)

OPTION-E

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

(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) What is the difference between algorithm and flowchart?

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) What is the difference between DO, DO WHILE and IF ( ) GOTO Loops?

g) What does the function REAL(x) do?

h) What is the difference between a Subprogram and a Subroutine?

i) What is LaTeX?

j) 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 5 properties of algorithm? Write an algorithm to read two numbers and find their sum.

$1 + 2 + 2$

b) 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. $\qquad$ 5

c) What are the most common Linux commands? What is the difference between C and C++?

$2 + 3$

d) Write a C program to find the integral using Simpson's one-third rule

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

e) Write a program to find factorial of a given number using Function. $\qquad$ 5

f) Write a program to solve and plot the output for visualization of the following differential equation:

$$6x^2 - 17x + 12 = 0$$

GROUP – C

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

a) What is difference between algorithm and pseudo code?

Write an algorithm for find the greater number between two numbers. Also draw the flowchart for it. 2+4+4

b) Write algorithm to this problem: Ramshewak 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 Ramshewak. 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. 10

GROUP–A

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

$2 \times 5 = 10$

a) Write down the full form of DAC and ADC.

b) What are the functions of a Q-meter?

c) Write down the unit of Capacitance and Inductance.

d) Write the number of types of multimeter, mention its name.

e) Write down the significance of a basic RLC bridge.

f) How will you measure time period of a signal by using CRO?

g) How will you measure frequency by using frequency counter?

h) Write down the major advantages of digital instruments over analog instruments.

GROUP – B

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

a) What is signal generator? Write down the basic applications of signal generator. 2+3

b) Draw the block diagram of a CRT and indicate each component. 3+2

c) Write down the steps for measuring the AC voltage by using a digital multimeter. What is the significance of 'Max hold' button in a digital multimeter? 3+2

d) Write down the Colour code for measuring resistance of a resistor. Explain briefly with a suitable example for measuring resistance of a resistor by colour code. 2+3

GROUP-C

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

$10 \times 2 = 20$

a) Draw the basic block diagram of a digital voltmeter (DVM). Write down the working principle of a DVM. What is the significance of ADC in a DVM. 3+5+2

b) Draw the block diagram of an AC milivoltmeter and write down its significance. Explain how time base is obtained in a CRO. (3+3)+4

c) Why a fluorescent screen is used in a CRT. Distinguish between a CRT and CRO. Draw the block diagram of a general purpose CRO and indicate its basic components.

2+3+(3+2)

d) Draw the block diagram of a Q-meter and give an outline of its working principle. The calibrated time base of a CRO is set at 0.1 ms/cm. The horizontal display switch is kept at the "5X magnified" position. A sinusoidal signal applied to the vertical deflection plates is 2½ cycles over a sweep width of 10 cm. Calculate the frequency of the signal. (3+3)+4

OPTION-G

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

(Applied Optics)

GROUP–A

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

$2 \times 5 = 10$

a) Write down the full forms of the following: LASER, FTS.

b) Explain the following terms in case of a laser system: optical pumping, population inversion.

c) What do you mean by spatial frequency filtering?

d) What do you mean by graded index and step index optical fibre?

e) What do you mean by transmission and reflection type holograms?

f) Write down two applications of holograms.

g) What do you mean by splice loss in optical fibre?

h) Give one example for each of the following: Gas laser and solid-state laser.

GROUP-B

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

   a) With the help of a suitable diagram explain the action of a semiconductor laser. 5

   b) What are the major advantages and disadvantages of optical fibre compared to other modes of communication? 5

   c) Write a short note on Fourier Transform Spectroscopy. 5

   d) Write down the full form of LED. Draw the I-V characteristics of a LED. What are the major advantages of LED bulbs compared to fluorescent bulbs? $1+2+2$

GROUP-C

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

   a) What are Einstein's A and B coefficients? 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. $2+3+5$

   b) What do you mean by acceptance angle and numerical aperture in an optical fibre? With the help of suitable diagrams derive the expressions for acceptance angle and numerical aperture of an optical fibre.

   $2+3+5$

   c) Explain briefly the basic principle of holography. Write down the names of different types of holograms. Write down the application of holography in microscopy. What is Fibre Bragg Grating? $3+2+3+2$

   d) What is fibre optic sensor? Discuss the concept of spatial frequency filtering. Show that a thin lens can be used as a Fourier Transformer. Describe how a transmission hologram is made. $2+2+3+3=10$

GROUP–A

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

    $2 \times 5 = 10$

    a) Write down the percentage composition of gas in atmosphere.

    b) Write down the name of all the layers of atmosphere.

    c) Define emissive power and absorptive power in radiation.

    d) What is ozone depletion?

    e) How can we measure wind speed and direction?

    f) State Kirchhoff's law of radiation.

    g) What are the causes of climate change?

    h) Mention the main factors that causes air pollution.

GROUP-B

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

    a) Derive the equation that shows the variation of temperature with height in troposphere.   5

    b) Name different types of temperature sensor. Briefly discuss how they work. $2+3$

    c) State and prove Stefan-Boltzmann law of radiation. $1+4$

    d) Define Coriolis force. Explain how it influences wind. $2+3$

GROUP-C

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

    a) i)   What do you mean by tropical cyclone?

        ii) Discuss briefly about Tornadoes and Hurricanes.

        iii) Define air masses and fronts. Explain how they affect weather. $2+4+4$

    b) i)   What is global warming?

        ii) Explain the cause and effect of global warming.

        iii) What is acid rain? Explain how it is formed. $2+4+(2+2)$

    c) i) What is weather forecasting?

        ii) Mention different methods of weather forecasting.

        iii) What are the criteria of choosing weather station?

        iv) Discuss briefly about geostationary and polar orbiting weather satellite.

        $2+2+2+4$

    d) Write short notes on: $5+5$

        i)   Aerosol

        ii) Anticyclone

(Physics Workshop Skill)

GROUP–A

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

    $2 \times 5 = 10$

a) What is an electrical relay?

b) What is S.I. unit of energy? Find its dimension.

c) What are various parameter of design of welded joint?

d) Define capacitance.

e) Find out the Vernier constant of a slide caliper having 100 Vernier divisions in Vernier scale. One main scale division is 0.05 cm.

f) Classify the manufacturing process?

g) Define "Resistance welding process".

h) Define least constant of a screw gauge.

GROUP-B

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

a) Draw the I-V characteristic curve of a Zener Diode. Explain the operation of a Zener Diode as a voltage regulator.   1+4

b) What are the advantages of laser beam welding over arc welding? Give specific application of laser beam welding.   3+2

c) What do you understand by drilling? Explain the different types of drilling mechanism.

          1+4

d) What are pulleys? What is the mechanical advantage of a pulley to lift a mass of 20 kg using pulley? Define weldability.   2+2+1

GROUP-C

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

a) What is casting? What are the steps involved in making a casting? What are the advantages of metal casting? Write down some application of Metal Casting. $1 + 4 + 2\frac{1}{2} + 2\frac{1}{2}$

b) i)   Explain the operation of a transistor as a switch.

    ii) What are the uses of a digital multimeter?

    iii) What are the hazards involved in soldering of electrical circuit?

    iv) What is the mechanical advantage of a lever?   4+2+2+2

c) i) Explain the different component of a CRO with schematic diagram.

ii) Find out an expression of electrostatic deflection sensitivity of cathode ray tube.

5+5

d) i) What is a bench vice? Explain the different uses of bench vice.

ii) What are the functions of brakes?

2+5+3

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