U.G. 3rd Semester Examination - 2021

PHYSICS

[PROGRAMME]

Skill Enhancement Course (SEC)

Course Code : PHY-G-SEC-T-1&3(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

(Technical Drawing)

GROUP-A

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

   a) What is CAD?

   b) Write the equation of an ellipse.

   c) Name any two drafting instrument.

   d) Name any two conic-section.

   e) Write the equation of a circle.

   f) What do you mean by spiral-helix?

   g) Write the principle of projections.

   h) What do you mean by development of a surface?

GROUP-B

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

   a) A line A - B, 90mm long is inclined at 30° to H.P. and A is 12mm above H.P. and 20mm in front of V.P Its front view measures 63mm. Draw the top view of AB and determine the inclination with H.P.   5

   b) Draw the projection of a circle of 50mm diameter resting on H.P. on a point A on its circumference its plane inclined at 45° to the H.P.   5

   c) Name any five fundamental commands to edit a drawing.   5

   d) Draw the projection of a triangular prism, base 40mm side and axis 30mm long, resting on one of its base on the H.P. with vertical face perpendicular to the V.P.   5
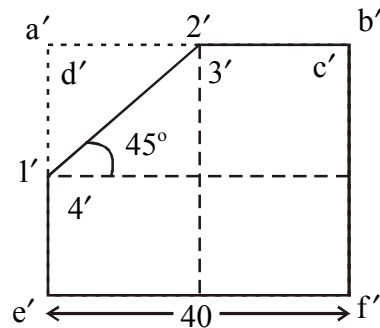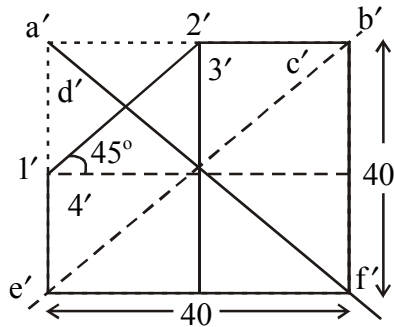
GROUP-C

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

a) What is isometric drawing? Draw the isometric view of a square prism sides of the base 20mm long. The axis 40mm long, the axis is vertical.
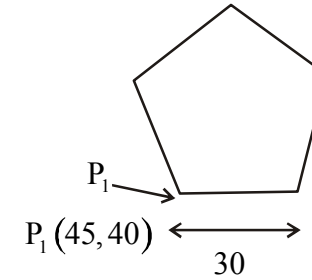
3+7=10

b) Name three methods of development. Draw the development of the surface of the part ρ of the cube the front view of which is shown in the given fig.

3+7=10

c) Draw a line diagram as shown in the given figure. Use Hatch, Rotate, Stretch and scale command.

10

d) A vertical cylinder of 73mm diameter is penetrated by a cone base 73mm diameter and axis 110mm long the two axis bisecting each other at right angle. Draw the front view showing lines of intersections. 10

OPTION-B

PHY-G-SEC-T-3

(Basic Instrumentation Skills)

GROUP-A

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

 a) Write down the unit of 'self inductance' and magnetic field.

 b) What is "measurement"?

 c) What is "loading effect"?

 d) Write down the types of millivoltmeter.

 e) Write down the full form of DVM and ADC.

 f) Distinguish between digital and analog instruments.

 g) How do you measure the inductance of a inductor by using multimeter?

 h) What do you mean by the term accuracy of a digital multimeter?

GROUP-B

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

 a) Write down the working principle for measuring voltage by a electronic voltmeter and also discuss it's advantages for measuring voltage over conventional multimeter.. 5

 b) What is function generator? How the electron beam is deflected in a CRT? 3+2

 c) Write short note on Q-meter. 5

 d) Write down the steps for measuring ac voltage and resistance of a wire by a conventional multimeter. 5

GROUP-C

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

10×2=20

 a) Draw the basic block diagram of a basic RLC-bridge. Write down the working principle and significance of that bridge. 3+5+2

 b) Write down the working principle for measuring time period, frequency by a frequency counter. Define the type of errors arise in a measurement. (3+3)+4

 c) Write short note on: (i) CRO and (ii) ac millivoltmeter. 5+5

 d) Draw a neat diagrarn of a CRT and discuss the significance of it's each component. What is the significance of ADC in a DVM? What is the significance of Max hold button in a digital multimeter? (2+3)+(3+2)

OPTION-C

PHY-G-SEC-T-3

(Electrical Circuit & Network Skills)

GROUP–A

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

   a) Explain why an ammeter should be of very low resistance?

   b) Explain what is the Q-factor of the coil?

   e) Draw symbol for current controlled voltage source.

   d) Write the condition to transfer Maximum Power to the load in a.c circuits.

   e) Explain what happens when a voltmeter is connected in series with the circuit?

   f) What is the main purpose of commutators and brushes for a generator?

   g) Indicate the various quantities that can be measured with a multimeter.

   h) What are the materials used for wiring?

GROUP-B

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

   a) State the maximum power transfer theorem. Explain the procedure to convert a practical voltage source into an equivalent current source. 2+3

   b) What is house wiring? What type of wire is used in a house? What is meant by industrial wiring? 2+1+2

   c) Establish the relations between resistors of equivalent star and delta connections. 5

   d) What is the significance of back EMF? An alternating voltage is given by V=230sin314t. Calculate (i) frequency, (ii) maximum value, (iii) average value, (iv) RMS value. 1+4

GROUP-C

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

   a) How can you protect the household electrical appliances from sudden unusual high voltage pulse? How a PN junction diode is working? Draw and explain V-I characteristics of PN diode with neat diagrams. 4+3+3

   b) Define real power and Power factor for an AC circuit. With a circuit diagram explain the principle of operation of a bridge (full wave) rectifier. 2+3+5

   c) What are the various types of drawing used for electrical wiring? Explain in detail.
   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+5

d) With a neat circuit diagram, explain the construction and principle of operation of DC Motor. Write short notes on the types of AC generators. 5+5

OPTION-D

PHY-G-SEC-T-1

(Applied Optics)

GROUP-A

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

a) What do you mean by population inversion and optical pumping?

b) Explain the termlight amplification in LASER.

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

d) Write down the full form of the following terms - FTS, MFD, NMR and LED.

e) Explain briefly how holography can be used in microscopy.

f) What is splice loss in optical fibre?

g) Explain briefly the concept of spatial frequency filtering.

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) Explain briefly the major advantages of optical fibre communication. 5

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

c) Explain briefly how FTS can be used in atmospheric remote sensing. 5

d) Write down the full form of LDR. Draw the I-V characteristics of a LDR. Explain briefly how LDR can be used in automatic street light control system? 1+2+2=5

GROUP - C

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

a) Discuss the concept of spatial frequency filtering. Show that a thin lens can be used as a Fourier Transformer. Write a short note on Fibre Bragg Grating. 2+3+5=10

b) What do you mean by attenuation in optical fibre communication? What are the major causes of attenuation in the said process? 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.

$$(3+3)+4=10$$

c) What do you mean by spontaneous and stimulated emission? What are Einstein's A and B coefficients? Establish the relations between A and B coefficients. $2+2+6=10$

d) 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. $4+2+4=10$

PHY-G-SEC-T-1

(Physics Workshop Skill)

GROUP–A

1. Answer any **five** questions: $2\times5=10$

   a) What is the purpose of tinning a soldering tip?

   b) Describe a regulated power supply. Give a circuit diagram of the same.

   c) Give the main applications of a lathe.

   d) Describe a pulley and its use.

   e) What are the CGS and SI units of energy? What is the relation between them?

   f) Why is cutting fluid used while cutting a metal?

   g) What is milling? Name two types of milling machines.

   h) What is vernier constant of a vernier caliper?

   GROUP-B

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

   a) Describe the construction and working principle of an electronic switch comprising of a transistor and a relay. 5

   b) Explain the importance of the number of teeth on a hacksaw blade when cutting different types

of material. What are the various kinds of files used to smoothen a rough edge? $2\frac{1}{2}+2\frac{1}{2}$

c) Describe the principle of operation of a screw gauge. How can the diameter of a thin wire be determined with it? $2\frac{1}{2}+2\frac{1}{2}$

d) How can the continuity of an electrical circuit be tested with a multimeter? Describe the construction of an oscilloscope. $2\frac{1}{2}+2\frac{1}{2}$

GROUP-C

3. Answer any **two** questions: $10\times2=20$

a) What is an electronic timer? Describe the construction and working principle of a timer circuit. $3+7$

b) Describe the construction and operating principle of a sextant. How can the height of a mountain be determined with it? $5+5$

c) How is welding different from soldering? Describe arc welding and gas welding. $2+8$

d) How are prime movers classified? What are the various classes of levers? How can a heavy load be lifted with a lever? $3+3+4$

(Radiation Safety)

GROUP-A

1. Answer any **five** questions: $2\times5=10$

a) What is KERMA?

b) What is isomer?

c) What is auger electron?

d) What is gamma ray? Which substance can shield it?

e) Name two devices which can determine radiation exposure.

f) What is straggling length of α particle?

g) What is the significance of packing fraction?

h) A GM counter is used to detect radiation. Name the types of radiation.

GROUP-B

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

a) Explain background radiation and its biological effect.

b) What are the applications of nuclear techniques in crime detection?

c) Describe the continuous β ray spectrum of radioactive substance.

d) What is Fission? Give example.

GROUP-C

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

a) What is radiation hazard? Explain radiation sickness. What are the main functions of International Commission on Radiological Protection?

b) What is the nature of the nuclear force? Discuss liquid drop model.

c) What safety precautions are required when using radiation? Define the terms absorbed dose, equivalent dose and effective dose.

d) Write short notes on:

   i) Photoelectric effect

   ii) Scintillation Detector

OPTION-G

PHY-G-SEC-T-1

(Computational Physics Skills)

GROUP-A

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

a) What is the purpose of a header file? Is the use of header file absolutely necessary?

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

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

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

e) What is LaTeX?

f) How do you compile a LaTeX file? How do you change the type style in LaTeX?

g) Write an algorithm to find average age of a group of 10 players.

h) Draw a flowchart to find the area of a circle of radius r.

i) Write the common programming languages which are used for science.

j) What are the basic components of Linux? How to copy file in Linux?

k) What is a virtual desktop?

GROUP–B

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

$$5\times2=10$$

a) What is MBR in Linux? What is the difference between C and C++? 2+3

b) Why do we use flowcharts? What are the five properties of algorithm? Design an algorithm with a natural number, n, as its input which calculates the following formula and writes the result in the standard output. 1+2+2

c) Write a C program to find the integral using Simpson's one-third rule 5

$$\int_{0}^{0.8} \log x + \sin(2x) + x^2 \ dx$$

d) Design an algorithm for plotting of a trajectory of a projectile thrown at an angle θ with the horizontal. 5

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

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

f) Explain the structure of Fortran coding sheet.

5

GROUP–C

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

$$10\times2=20$$

a) Write a program to find matrix multiplication using subroutine. 2+8

b) What is difference between algorithm and pseudo code? Explain steps involved in drawing of a flowchart. Write an algorithm to calculate even numbers between 0 and 99. Also draw the flowchart for it. 2+3+2+3

c) Type the 1st page of this question paper in your answer script using LaTex command. 10

d) 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

e)   Write a program to find a transpose of a matrix. Write short notes on:

i)   Call statement

ii)   Save statement.   4+3+3

OPTION-H

PHY-G-SEC-T-1

(Weather Forecasting)

GROUP-A

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

a)   What is latent heat of vaporization?

b)   State the laws of radiation of heat.

c)   What are the harms of Ozone layer depletion?

d)   Write the causes of the flow of heat waves.

e)   Write the names of the components of air.

f)   How the air is polluted?

g)   What do you understand by atmospheric pressure?

GROUP-B

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

a)   Discuss the Satellite observations in weather forecasting.

b)   Discuss the variation of pressure and temperature with height.

c)   Differentiate between tornadoes and hurricanes. What are the origins of these two?

d)   What are the causes of climate change and Ozone depletion?

GROUP-C

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

a)   What is weather forecasting? Discuss different methods of weather forecasting.   4+6

b)   Discuss the compositional layering of the atmosphere. What are the temperature sensors? Discuss its working principles.   5+2+3

c)   Write short notes on: 5+5

i)   Jet streams

ii)   Environmental issues related to climate.

d) What do you understand by absorption and emission of radiation? What is the relation between absorptive and emissive powers of a body? 6+4

OPTION-I

PHY-G-SEC-T-1

(Renewable Energy & Energy Harvesting)

GROUP-A

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

a) Define geothermal energy and its resources.

b) Give two examples of Biomass and write down one advantage of Biomass energy.

c) What is meant by photovoltaic effect?

d) What are carbon capture technologies? Write down two advantages of it.

e) Write down the advantages and limitations of fossil fuel.

f) What are the main applications of solar pond?

g) How is energy obtained from tides?

GROUP-B

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

a) Write down the factors which influence output of wind energy converter. Explain briefly working principle of a wind turbine. 2+3

b) What are conventional and nonconventional sources of energy? Write down all major differences between them. 2+3

c) What is the basic principle of Ocean Thermal Energy Conversion (OTEC)? Where are OTEC plan located? 3+2

d) Draw a neat diagram of a solar cell. Write down working principle of it. Draw I-V characteristics of it. 1+3+1

GROUP-C

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

a) i) Write down basic principle of wind energy conversion.

ii) Obtain the expression for the power development due to wind.

iii) Wind at 1 standard atmospheric pressure and 15°C has velocity 15m/s. The turbine

has diameter 130m and operating speed 45 r.p.m. at maximum efficiency. Calculate total power produced. 3+4+3

b)   i)   What do you mean by piezoelectric effect? Write down names of two naturally occurring piezoelectric materials.

ii)   Explain piezoelectric effect by simple molecular method.

iii)   How piezoelectric energy harvested from human motion?   (2+1)+4+3

c)   Write short notes on (any **two**):   5+5

i)   Environmental issues and Renewable sources of energy.

ii)   Electromagnetic energy harvesting.

iii)   Solar Green House

d)   i)   Write down environmental impacts of hydropower sources.

ii)   Describe briefly how hydroelectric power is generated.

iii)   Write down main advantages of hydropower.   3+4+3

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