U.G. 3rd Semester Examination - 2023
PHYSICS
[PROGRAMME]
Skill Enhancement Course (SEC)
Course Code : PHY-G-SEC-T-1&3(A), (B), (C), (D) & (E).

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 Options.

OPTION-A
PHY-G-SEC-T-3
(Electrical Circuit and Network Skills)
GROUP-A

1. Answer any **five** questions:

   $2 \times 5 = 10$

   a) What is the full form of P.V.C cable?

   b) Calculate the r.m.s value of the current given by $i = I_0 + I_1 \sin(\omega t + \theta)$.

   c) What is average current and r.m.s current in an ac circuit?

[Turn over]

d) What is series resonant circuit? Why it is called an acceptor circuit?

e) If a shunt of 1 Ω is connected to a galvanometer of resistance 99 Ω, what fraction of the main current will flow through the galvanometer?

f) Give any two example of circuit breaker.

g) In a series LCR circuit at resonance calculate the power factor?

h) Explain the effect of temperature on resistance?

GROUP B

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

a) What do you mean by ideal voltage source and ideal current source? Give their circuit symbols. Give examples of practical current and voltage sources.   2+2+1

b) What is cables? Describe parts of cable and explain any one type of cable.   1+2+2

c) What will happen when DC voltage applied to a series LR circuit? Also explain the term time constant.   3+2

439/Phs.   (2)

d) Find out an expression of the impedance Z of a parallel resonance circuit as a function of applied frequency ω, resistance R, inductance L and capacitance C. Keeping other constants, determine how does the current vary with capacitance C.   4+1

GROUP-C

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

a) Draw the constructional diagram of a.c generator. Explain construction of a.c generator and briefly explain its working principle.

3+3+4

b) Draw the constructional diagram of d.c motor. Explain construction of d.c motor and briefly explain its working principle.   3+3+4

c) What is fuse? Give it's importance. Give the principle of operation of fuses. Give advantage and disadvantages of rewirable fuses. 2+2+3+3

d) What is conductor? Give the properties of good conductor and describe types of conductor.

2+3+5

OPTION-B

PHY-G-SEC-T-3

(Weather forecasting)

GROUP-A

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

     a)   What is the difference between meteoroid and meteorite?

     b)   What is solar constant?

     c)   What do you mean by EL-NINO?

     d)   What is Global warming potential?

     e)   What are Van Allen Belts?

     f)   Define Easterly Jet Stream.

     g)   What is Adiabatic Lapse Rate?

     h)   State the mechanism behind formation of convective clouds.

GROUP B

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

     a)   Briefly discuss the problems of weather forecasting.

     b)   What is air parcel? Calculate the virtual temperature of air at 1000 milibar level at

300K temperature (Vapour pressure 13.7 milibar). 2+3

c) Give a schematic diagram of inversion of temperature. What is catabetic wind? 4+1

d) Explain the Electron density profile of ionosphere. How you do the mapping of Wind speed? 3+2

GROUP-C

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

a) What are the different components of monsoon? Describe Global wind systems. Explain tropical cyclone.

b) Discuss the climatological significance of SST.

c) What is DALR? Compute the relation the relation between DALR and SALR.

d) Give a schematic diagram of the cloud structure of a typical thunderstorm. Highlight the charge separation zone.

OPTION-C

PHY-G-SEC-T-3

(Basic Instrumentation Skills)

GROUP-A

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

   a) What do you mean by the term "loading effect" of a measuring instrument?

   b) Why a voltmeter should have a high resistance?

   c) Distinguish between a "CRO" and "CRT".

   d) Why is fluorescent screen used in CRO?

   e) What are the precautions taken while using a DC voltmeter and DC ammeter?

   f) How is electron beam in a CRT deflected horizontally and vertically?

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

   h) Write down different types of ac millivoltmeter.

GROUP B

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

   a) Describe briefly about errors in measurement and sensitivity of a measuring instrument. 5

b) Draw the block diagram of a CRO and write down two application of CRO.

c) Draw the block diagram of basic RLC bridge and explain briefly the function of each components. 5

d) What is digital multimeter and explain briefly its working principle. 2+3

GROUP-C

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

a) Draw a neat sketch of a CRT with electrostatic focusing and deflection system and explain briefly the function of each part. How can you measure the phase difference between two ac voltages of same frequency of a signal voltage by CRO? (3+2)+5

b) Draw the block diagram of an ac mill voltmeter and explain its operation. Write a short note on a pulse generator. 3+2+5

c) What is Q meter? Write down its working principle. How can you measure L and C by Q meter? (2+2)+6

d) With suitable diagram describe the working principle of a frequency counter. How do you measure the frequency using Universal counter? How do you check 'continuity' of a circuit by using multimeter? (3+3)+2+2

439/Phs. (7) [Turn over]

OPTION-D

PHY-G-SEC-T-1

(Radiation Safety)

GROUP-A

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

   a) Give three applications of nuclear technique in crime detection.

   b) What does the Q value of a nuclear reaction signify?

   c) What are auger electron?

   d) What is linear attenuation coefficient?

   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: $5 \times 2 = 10$

   a) Explain background radiation and its biological effect.

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

c) How do neutrons interact with matter? Explain.

5

d) How are nuclear techniques applied in the field of medical science?

5

GROUP-C

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

a) Explain the phenomena of Photoelectric effect and Compton scattering.

5+5

b) Describe a Geiger Muller (GM) counter and explain its working.

3+7

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-E

PHY-G-SEC-T-1

(Renewable Energy & Energy Harvesting)

GROUP-A

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

   a) What are the differences between renewable and non-renewable energy?

   b) What is the basic principle of carbon-capture technology?

   c) What are clean energy sources?

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

   e) What are the primary and secondary energy sources? Give examples.

   f) Write down the principle of wind energy conversion.

   g) What is the future of bio fuels in India?

   h) Explain the direct and the converse piezoelectric effects.

GROUP B

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

   a) Draw a neat diagram of a hydroelectric power plant and explain its working. 2+3

b) Write applications of piezoelectric energy harvesting.   5

c) What is a solar cell? Give the basic construction and working principle of a solar cell.   2+3

d) What are the main characteristics of a good power plant site?   5

GROUP-C

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

a) What is solar pond? Explain the construction and working of solar pond with diagram. What are its different types?   1+5+4

b) i) What are the main components of a battery? What is the basic difference between a primary battery and a secondary battery? Discuss the factors affecting the battery's performance and life.

   ii) Discuss the basic principle on which all electromagnetic generators work.   (2+2+3)+3

c) i) Write the basic principle of wind energy conservation.

ii) Discuss construction and Working of a turbine. 5+5

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

   i) Greenhouse effect
   ii) Tidal current
   iii) Solar cooker.

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