SH-III/Physics-301C-5(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32411 **Course Code : SHPHS-301C-5(T)**

Course Title : Mathematical Physics II

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

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

Section–I

1. Answer *any five* questions: 1×5=5

(a) Complex number $Z = 1 + \sqrt{3}\,\hat{\imath}$, write it in polar form.

(b) State Cauchy's integral theorem.

(c) What is cyclic co-ordinate?

(d) If λ be an eigenvalue of a matrix A (non-zero matrix), show that λ^{-1} is an eigenvalue of the matrix A^{-1}.

(e) What is the nature of singular point for a complex function $f(z) = \frac{\sin z}{z}$?

(f) Calculate the probability of obtaining 4 heads in 6 tosses using an unbiased coin.

(g) Define a linear operator.

(h) Write down Lagrangian equation for a simple pendulum.

Section–II

Answer *any two* questions: 5×2=10

2. (a) Prove that $u = e^{-x}\,(x \sin y - y \cos y)$ is harmonic.

(b) Find v such that $f(z) = (u + iv)$ is analytic. 2+3=5

3. Find the eigenvalues and eigenvectors of the given matrix.

$$A = \begin{pmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{pmatrix}$$ 2+3=5

4. Show that shortest distance between two points is always a straight line. 5

5. Show that Dirac delta function can be represented as a limit of a Gaussian function and rectangular function. 5

Section–III

Answer *any one* question: 10×1=10

6. (a) Show that eigenvalues of a Hermitian matrix are real.

(b) What is similarity transformation? Diagonalize the matrix $A = \begin{pmatrix} 4 & 1 \\ 2 & 3 \end{pmatrix}$ through similarity transformation.

(c) Prove that the matrix $\frac{1}{\sqrt{3}} \begin{bmatrix} 1 & 1+i \\ 1-i & -1 \end{bmatrix}$ is unitary matrix. 3+(1+3)+3=10

7. (a) Evaluate $\int_0^\infty \frac{dx}{x^6+1}$.

(b) Find the residue of the complex function $f(z) = \frac{e^z}{z^4}$.

(c) Evaluate $\int_{1-i}^{2+i} (2x + iy + 1)\,dz$ along the straight line joining $(1 - i)$ and $(2 + i)$. 5+2+3=10

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SH-III/Physics-302C-6(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32412 **Course Code : SHPHS-302C-6(T)**

Course Title : Thermal Physics

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

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

Section–I

1. Answer *any five* questions: 1×5=5

(a) What do you mean by thermodynamic equilibrium?

(b) State the law of correspondence states.

(c) What is Boyle temperature?

(d) Calculate the work done by 1 mole of gas during a quasi-static isothermal expansion from a volume V_i to a volume V_f, when the equation of state is $P(V–b) = RT$.

(e) State law of equipartition of energy.

(f) What is Gibbs potential?

(g) State the second law of thermodynamics in terms of entropy.

(h) What is temperature of inversion?

Section–II

Answer *any two* questions: 5×2=10

2. (a) What are critical constants of a gas?

(b) Obtain their values in terms of the constant of Van der Waals equation. 1+4=5

3. Derive the expression of co-efficient of viscosity using transport phenomenon. 5

4. Derive Clapeyron's equation $\frac{dP}{dT} = \frac{L}{T(V_2-V_1)}$, where the symbols have their usual meaning. What are the characteristics of a λ transition? 4+1=5

5. (a) Define entropy.

(b) Show that the change in entropy is independent of path.

(c) State briefly the physical significance of entropy. 1+2+2=5

Section–III

Answer *any one* question: 10×1=10

6. (a) Define Joule-Thomson effect.

(b) Show that the *J-T* co-efficient $\mu = \left(\frac{\partial T}{\partial P}\right)_H$ can be written as $\mu = \frac{1}{Cp}\left[T\left(\frac{\partial V}{\partial T}\right)_P - V\right]$. Symbols are of usual meanings.

(c) Show that *J-T* effect is zero for ideal gas.

(d) Write down the Maxwell's four thermodynamic relation.

(e) Prove $Tds = C_P\, dT - T\left(\frac{\partial V}{\partial T}\right)_P dP$. 1+3+2+2+2=10

7. (a) Deduce the expressions for the work in isothermal and adiabatic expansion of a perfect gas in terms of temperature.

(b) Explain what is meant by a reversible thermodynamic process.

(c) Prove that the efficiency of a carnot engine is $\eta = 1 - \frac{T_2}{T_1}$, where T_1 and T_2 are the temperature of source and sink respectively. 3+2+5=10

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SH-III/Physics-303C-7(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32413 **Course Code : SHPHS-303C-7(T)**

Course Title : Digital Systems and Applications

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

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

Section–I

1. Answer *any five* questions: 1×5=5

(a) Convert $(11101{\cdot}101)_2$ into decimal number.

(b) Prove that $\left(B\overline{C} + \overline{A}D\right)\left(A\overline{B} + C\overline{D}\right) = 0$.

(c) What is the limitation of half adder?

(d) How does a sequential logic system differ from combinational logic system?

(e) Write de Morgan's theorems.

(f) How many select inputs are required for 8 : 1 multiplexer?

(g) What is monolithic integrated circuit?

(h) What is 'Cache' memory?

Section–II

Answer *any two* questions: 5×2=10

2. What do you mean by positive logic? Draw the circuit diagram of positive logic AND and OR gates using diodes and explain their operations. 1+(2+2)=5

3. What is a multiplexer? Design a 4 : 1 multiplexer using basic gates and explain its operation with truth table. 1+4=5

4. Draw the functional block diagram of 555 timer. Explain the operation of an astable multivibrator using 555 timer. 1+4=5

5. Given $f = AB + AC + C + AD + ABC$, express f in standard SOP form. Minimize it using K-map. Realize the minimized expression using NAND gates only. 1+3+1=5

Section–III

Answer *any one* question: 10×1=10

6. (a) What is flip-flop? Write down some uses of flip-flops.

(b) Is there any difference between latch and Flip-flop?

(c) What is S-R flip-flop? Explain the operation of a clocked SR flip-flop with truth table.

(d) What do you mean by race around condition? (1+1)+1+(1+5)+1=10

7. (a) Discuss the principle of operation of a binary full adder circuit by drawing proper circuit diagram. Write the Boolean expressions of its 'Sum' and 'Carry' outputs.

(b) Draw the circuit diagram of a serial-in serial-out 4 bit shift register and explain its working principle. (4+2)+(2+2)=10

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SH-III/Physics-304GE-3(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32414 **Course Code : SHPHS-304GE-3(T)**

Course Title: Physical Optics and Modern Physics

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি প্রশ্নের পূর্ণমানের নির্দেশক।
পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

Section-A

বিভাগ-ক

1. Answer *any five* questions: 1×5=5

নিম্নলিখিত *যে কোনো পাঁচটি* প্রশ্নের উত্তর দাও ঃ

(a) What is meant by Coherent Source?
সুসংহত আলোক উৎস বলতে কী বোঝায়?

(b) State the law of radioactive disintegration.
তেজস্ক্রিয় বিঘটনের সূত্রটি বিবৃত করো।

(c) Calculate the de-Broglie wavelength associated with an electron of kinetic energy 10 eV.
10 eV গতিশক্তি সম্পন্ন ইলেকট্রনের ডি-ব্রগলি তরঙ্গ দৈর্ঘ্য নির্ণয় করো।

(d) Write down the Brewster's law of polarisation.
সমাবর্তন সংক্রান্ত ব্রুস্টারের সূত্রটি লেখো।

(e) What is mass defect?
ভর ঘাটতি বলতে কী বোঝায়?

(f) State the Heisenberg's uncertainty principle.
হাইজেনবার্গের অনিশ্চয়তার সূত্রটি বিবৃত করো।

(g) What is Grating element?
গ্রেটিং উপাদান কাকে বলে?

(h) What are Miller Indices?
মিলারের সূচক বলতে কী বোঝো?

Section-B
বিভাগ-খ

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

নিম্নলিখিত *যে কোনো দুটি* প্রশ্নের উত্তর দাও ঃ

(a) What are Newton's rings? Explain how the wavelength of a monochromatic light is calcualted with the help of Newton's rings. 1+4=5

নিউটন রিং কাকে বলে? নিউটন রিং-এর সাহায্যে একবর্ণী আলোর তরঙ্গ দৈর্ঘ্য নির্ণয়ের পদ্ধতি বর্ণনা করো।

(b) Show that the mean life of an unstable nucleus is equal to $1/\lambda$ where λ is the decay constant. What is the relation between mean life and half life? 4+1=5

দেখাও যে, একটি অস্থায়ী নিউক্লিয়াসের গড় আয়ু $1/\lambda$-এর সমান, যেখানে λ হল ঐ তেজস্ক্রিয় বস্তুর ক্ষয়ধ্রুবক। অর্দ্ধায়ুর সাথে গড় আয়ুর সম্পর্ক কী?

(c) Compare between Grating Spectrum and Prism Spectrum. What is optical activity and what do you mean by specific rotation? 2+1½+1½=5

গ্রেটিং বর্ণালী ও প্রিজম বর্ণালীর তুলনা করো। আলোক সক্রিয়তা ও আপেক্ষিক আবর্তন বলতে কী বোঝো?

(d) Why X-ray is used in the study of Crystal Structure? Derive Bragg's Law in X-ray Diffraction. 1+4=5

কেলাসের গঠন নির্ণয়ে X-রশ্মি কেন ব্যবহার করা হয়? X-রশ্মির অপবর্তন সংক্রান্ত ব্র্যাগের সূত্রটি বিবৃত করো।

Section-C
বিভাগ-গ

3. Answer *any one* from the following questions: 10×1=10

নিম্নলিখিত *যে কোনো একটি* প্রশ্নের উত্তর দাও ঃ

(a) Write down time independent and time dependent Schrodinger equation. What is eigenvalue and eigenfunction? A particle moving in a one-dimensional box and its wave function is $\psi(x) = A\sin\left(\frac{n\pi}{a}x\right)$; Normalise the wave function. What are the characteristics of wave function? (2+2)+4+2=10

সময় নিরপেক্ষ ও সময় সাপেক্ষে শ্রোডিংগার তরঙ্গ সমীকরণগুলি লেখো। আইগেন মান ও আইগেন অপেক্ষক বলতে কী বোঝো? একটি একমাত্রিক বাক্সের মধ্যে একটি কণা চলাফেরা করছে এবং এর তরঙ্গ অপেক্ষক হল $\psi(x) = A\sin\left(\frac{n\pi}{a}x\right)$; তরঙ্গ অপেক্ষকটি স্বাভাবিক (normalise) করো। তরঙ্গ অপেক্ষকের বৈশিষ্ট্যগুলি লেখো।

(b) Explain the process of diffraction by a double slit with proper ray diagram. Describe different parts of diffraction pattern produced by the double slit. What will be the change in diffraction pattern if the distance between the two slits is increased? 3+5+2=10

যুগ্ম রেখাছিদ্রের দরুন অপবর্তনের ঘটনাটি প্রয়োজনীয় আলোকচিত্রসহ বর্ণনা করো। যুগ্ম রেখাছিদ্রের দ্বারা গঠিত অপবর্তন নকশার প্রকৃতি আলোচনা করো। এই পরীক্ষায় ছিদ্রদ্বয়ের অন্তর্বর্তী দূরত্ব বৃদ্ধি করলে অপবর্তন ঝালরের কী পরিবর্তন দেখা যাবে?

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SH-III/Physics-305SEC-1(T)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32415 **Course Code : SHPHS-305SEC-1(T)**

Course Title : Computational Physics

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

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

1. Answer *any five* of the following:

(a) What is keyword? Give example. 2

(b) What is variable? Give example. 2

(c) What is gnuplot? 2

(d) What is array? How we can draw an one dimensial array in Fortran? 2

(e) How do we add a single line comment in Fortran? 2

(f) What are internal command in linux? Give example. 2

(g) What is the fortran syntex to open a file? 2

(h) Write a Fortran equivalent for the expression $Z = \frac{x^2+y^2}{2}$. 2

2. Answer *any four* of the following:

(a) What is algorithm? Write an algorithm to find the largest among three numbers. 1+4=5

(b) What is flowchart? Draw a flowchart that will find the root of a quadratic equation. 1+4=5

(c) What do you mean by control statement? Explain if-then-else statement with an example. 2+3=5

(d) State the function of while-do statement with suitable example.

(e) How to plot a vertical line in gnuplot? How to produce graph of an exact border size? 2+3=5

(f) What is Latex? How do we add an image in Latex? Write a latex equivalent code for the expression $Z = \frac{(x^2+y^2)}{2} + \sin(n)$. 1+2+2=5

3. Answer *any one* of the following:

(a) Explain different data types in Fortran. Write a Fortran program to find the factorial of a given number. 4+6=10

(b) Explain different operators in Fortran. Write a Fortran program to print Fibonacci series up to *n* terms. 4+6=10

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B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32415 **Course Code : SHPHS-305-SEC-1(T)**

Course Title : Renewable Energy and Energy Harvesting

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

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

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

(a) Name two green house gases.

(b) What are the main characteristics of a material to exhibit piezoelectric effect?

(c) What is selexol?

(d) Why is renewable energy important?

(e) What is Photovoltaic effect?

(f) What are the different ways to use solar energy?

(g) Mention the factors on which the generation of hydroelectricity depends.

(h) What is tidal energy?

2. Answer *any four* questions: 5×4=20

(a) Explain the terms non-renewable and renewable energy sources with suitable examples. 5

(b) What are the factors that may influence the efficiency of solar energy operated devices. Name four solar energy operated devices. (3+2)=5

(c) Explain the operation of a photovoltaic cell. How is the photovoltaic energy generated? 3+2=5

(d) What do you mean by geo-thermal energy? Briefly describe the working principle of a Geo-thermal plant. 1+4=5

(e) What are the technologies that can be used to capture CO_2? Briefly explain the process of Post-combustion CO_2 capture technique. 2+3=5

(f) Discuss how the wind energy can be utilized as renewable energy source. 5

3. Answer *any one* question: 10×1=10

(a) What is a solar cell? Briefly explain the operating principle of a solar cell. Sketch and discuss typical characteristics curves of a solar cell. What are the factors on which the open-circuit voltage across a solar cell depend? 1+4+3+2=10

(b) What is the source of energy of Sun? Explain the origin of nuclear energy. Write the merits and demerits of using nuclear energy/nuclear Power plant. 2+3+5=10

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B.Sc. Semester III (Programme) Examination, 2018-19

PHYSICS

Course ID : 32418 **Course Code : SPPHS-301C-1C(T)**

Course Title : Physics-III

Time: 1 Hour 15 Minutes **Full Marks: 25**

The figures in the margin indicate full marks.

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

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি পূর্ণমান নির্দেশক।
পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

Section-A

বিভাগ - ক

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

নিম্নলিখিত *যেকোনো পাঁচটি* প্রশ্নের উত্তর দাও ঃ

(a) What do you mean by coherent sources of light?

সুসংহত আলোক-উৎস বলতে কী বোঝায়?

(b) Why Newton's rings produce a dark spot at the centre of the rings?

নিউটন বলয়ের পরীক্ষায় বৃত্তাকার ঝালরের কেন্দ্রবিন্দু কৃষ্ণবর্ণ হয় কেন?

(c) What do you mean by magic number in nuclear physics?

ম্যাজিক সংখ্যা বলতে কী বোঝায়?

(d) What is the difference between unpolarized light and polarized light?

অসমবর্তিত এবং সমবর্তিত আলোর মধ্যে পার্থক্য কী?

(e) What is unit cell?

একক কোষ (unit cell) কাকে বলে?

(f) Write down any one definition of a unit of radioactivity.

তেজস্ক্রিয়তার যেকোনো একটি এককের সংজ্ঞা দাও।

(g) What is the dimension of wave function in one dimensional space?

একমাত্রিক তলে তরঙ্গ অপেক্ষকের মাত্রা কী?

(h) What is the path difference if phase differences of two points along a line of wave propagation is $\pi/3$?

তরঙ্গ প্রবাহরেখার দুটি বিন্দুর মধ্যে দশা পার্থক্য $\pi/3$ হলে, পথ পার্থক্য কত?

Section-B

বিভাগ - খ

Answer *any two* of the following: 5×2=10

যেকোনো দুটি প্রশ্নের উত্তর দাও ঃ

2. (a) Write down the difference between zone plate and convex lens.

মন্ডল ফলক ও উত্তল লেন্সের পার্থক্য লেখো।

(b) What is specific rotation? Write down its unit. 3+2=5

আপেক্ষিক আবর্তন কাকে বলে? এর একক কী?

3. (a) A radioactive source, 10^{-6} gm of Pu–239 produces 2200 α − particle per second. What is the half life of plutonium? (3+2)=5

একটি তেজস্ক্রিয় উৎসঃ 10^{-6} gm Pu–239 সেকেন্ডে 2200 α-কণা নিঃসৃত করে। প্লুটোনিয়ামের অর্ধায়ু নির্ণয় করো।

(b) What is Carbon dating?

তেজস্ক্রিয় কার্বন ডেটিং বলতে কী বোঝো?

4. (a) Establish the Bragg's equation.

ব্র্যগ সমীকরণ প্রতিষ্ঠা করো।

(b) Lattice constant d of a crystal is $2{\cdot}8\times10^{-10}$ m. Glancing angle of 1st order of X-ray in this crystal is 30°. Find out the wavelength of this X-ray. (3+2)=5

একটি কেলাসের জাফরি ধ্রুবক d = $2{\cdot}8\times10^{-10}$ m । ঐ কেলাসে X-রশ্মির প্রথম পর্যায়ের তির্যক কোণ 30° হলে, X-রশ্মির তরঙ্গ দৈর্ঘ্য হিসাব করো।

5. Explain the theory of formation of Fraunhoffer diffraction pattern by a single slit with a neat diagram. 5

পরিষ্কার চিত্রসহ একক রেখছিদ্র কর্তৃক ফ্রনহফার অপবর্তন ঝালর গঠনের তত্ত্ব ব্যাখ্যা করো।

Section-C

বিভাগ - গ

Answer *any one* of the following: 10×1=10

নিম্নলিখিত *যেকোনো একটি* প্রশ্নের উত্তর দাও ঃ

6. Describe Young's experiment in interference and write the condition for constructive and destructive interference. 8+2=10

আলোর ব্যতিচার সম্পর্কিত ইয়ং পরীক্ষা বর্ণনা করো। এ থেকে ধ্বংসাত্মক এবং গঠনমূলক ব্যতিচার উৎপন্নের শর্তগুলি উল্লেখ করো।

7. (a) Write down the time-independent and time-dependent Schrodinger wave equation.

সময় নিরপেক্ষ এবং সময় -সাপেক্ষ শ্রোডিংগার তরঙ্গ সমীকরণগুলি লেখো।

(b) What do you mean by eigenvalue and eigenfunction?

আইগেন মান এবং আইগেন অপেক্ষক বলতে কী বোঝো?

(c) What is binding energy and packing fraction of a nucleus? Draw a graph of mass number (A) with packing fraction and explain the idea of nuclear stability from this graph.

2+2+(2+2+2)=10

নিউক্লিয়াসের বন্ধনশক্তি ও সমাবেশ ভগ্নাংশ কী? ভরসংখ্যার সহিত সমাবেশ ভগ্নাংশ পরিবর্তনের একটি লেখচিত্র অঙ্কন করো। এই লেখচিত্র থেকে একটি নিউক্লিয়াসের সুস্থিরতা সম্পর্কে কী ধারণা পাওয়া যায়?

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SH-III/Physics-301C-5(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32421 **Course Code : SHPHS-301C-5(P)**

Course Title : Mathematical Physical Lab

Time: 2 Hours **Full Marks: 15**

The questions are of equal value.

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

Write and run three Python programmes by taking at least one from each group.

Group-A

1. (a) Write a program to find the given number whether even or odd.

(b) Write a program to display number from 1 to 10.

(c) Write a program to check a given number is zero, positive or negative.

(d) Write a program to check whether the given number is prime or not.

(e) Write a program to find the factorial of a number provided by the user.

(f) Write a program to find the root of a quadratic equation.

(g) Write a program to find the sum of number from 1 to 100.

(h) A list is given as Names = ["Tom", "John", "Harry"]. Write a Python program which will print the output as (in three separate lines)

How are you Tom?

How are you John?

How are you Harry?

Group-B

2. (a) Write a program to find the area of a square.

(b) Write a program to find the volume of a sphere.

(c) Write a program to determine to sum of given three numbers.

(d) Write a program to generate random numbers between 0 and 9.

(e) Write a program to find mean of the following numbers using list: 9, 5, 4, 2, 0.

(f) Write a program to find the area of a circle with radius as input.

(g) (i) Make a list of the following numbers 3, 9, 27, 81, 81, 243.

(ii) Arrange the list in reverse order.

(iii) Find the item with maximum value.

(iv) Find the location of the maximum value.

(h) Write a program to the area of a triangle.

Group-C

3. (a) Write a program to find a root of the equation $x^3 - 4x - 9 = 0$ using bisection method.

(b) Write a python code to find a root of the polynomial $f(x) = x^2 - 65$ by employing Newton-Raphson method.

(c) Write a program to find a root of the equation $x^3 - 5x + 1 = 0$ using second method.

(d) Write a program to find a root of the equation $x^3 - 2x - 8 = 0$ by employing Newton-Raphson method.

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B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32421 **Course Code : SHPHS-301C-5(PI)**

Course Title : Mathematical Physics-II Lab

Instruction to the Examiner.

The Examiners are requested to provide python 2.7 version to perform the programs as required in question.

The Laboratory Notebook must be submitted by the candidates before taking the answer script and question. Students have to write down three questions taking one question from each group and return the question to the examiner. After completion of writing the programs in answer script, the students are allowed to use computer. Examiners are requested to put down their signature in answer script after checking the program clearly mentioning if the program runs successfully or not.

Marks distribution is as follows.

Laboratory Notebook	:	2
Marks of group 'A' question	:	3
Marks of group 'B' question	:	4
Marks of group 'C' question	:	6

Full credit will be given if the program runs successfully. In case the program fails to run, examiners are requested to give credit of maximum 1 mark for group A, 2 marks for group B & 2 marks for group C questions respectively for writing the program in answer script. No marks should be given to LNB which has not been signed.

SH-III/Physics/302/C-6(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32422 **Course Code : SHPHS/302/C-6(P)**

Course Title : Thermal Physics Lab

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

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

(One experiment is to be performed)

1. Determine the mechanical equivalent of J, by Calendar and Barne's constant flow method. (Take reading for two different currents. Resistance of the potentiometer wire to be supplied.

(a) Definition of the quantities to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling 1

Data Recording

(d) Recording of heating current. 1·5×2=3

(e) Measurement of rate of water flow. 1·5×2=3

(f) Other records (Temperature difference, voltmeter reading etc) 2

(g) Calculation. 1

(h) Accuracy. 1

2. Determine the coefficient of thermal conductivity of Cu by Searle's Apparatus. (Diameter and length of the bar to be supplied)

(a) Definition of the quantities to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

Data Recording

(c) Reading of temperature during variable and steady state 4

(d) Mass of water collected per second at steady state. 4

(e) Recording of barometer reading. 1

(f) Calculation. 1

(g) Accuracy. 1

3. Determine the coefficient of thermal conductivity of bad conductor by Lee and Charlton's method. (Thickness and radius of the experimental sheet, mass and specifc heat of the lower disc are to be supplied)

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

Data Recording

(c) Time-temperature recording for steady state. 3

(d) Time-temperature recording for cooling. 4

(e) Cooling curve. 2

(f) Calculation. 1

(g) Accuracy. 1

4. Determine the temperature coefficient of resistance by platinum resistance thermometer.

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling. 1

Data Recording

(d) Electrical mid point of the bridge wire. 1

(e) Recording of null points when thermometer is kept in

(i) room temperature 3½

(ii) Steam 3½

(f) Calculation. 1

(g) Accuracy. 1

5. Study the variation of thermo emf of a thermocouple with difference of temperature of its two junctions. [Resistance of the potentiometer to be supplied]

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling. 1

Data Recording

(d) Data for null point 5

(e) Graph 3

(f) Calculation. 1

(g) Accuracy. 1

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B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32422 **Course Code : SHPHS-302C-6(PI)**

Course Title : Thermal Physics Lab

Instruction to the Examiner.

The Examiners are requested to paste one question on a card with respective serial number of the question. Cards may be duplicated, but the total number of cards may exceed the number of examinees. A list of arranged experiment sets signed by both the examiners along with answer script packet should be sent to the University. In no case, Examination will be conducted by the Examiner alone. Secrecy of the result must be maintained.

Each candidate should perform the experiment which is noted on the card drawn by him/her. The examiners may, however, use their discretion in offering him/her a second chance only after drawing card by all candidates. The Laboratory Notebook must be submitted by the candidates before drawing of the card. **No credit should be given to Notebook which has not been signed.**

Candidates are required to write down the questions on one answer-script with respective number of the questions and return the card to the examiner. Candidates will first write down the theory (only for working formula explaining the symbol used) in presence of examiners and get them signed by either of the examiners.

Examiners are requested to see that the candidates are working according to instruction and to sign some important data for the experiment. Each answer script should be examined jointly by the Internal and External Examiner and should bear the signature of both examiners. All changes must be initiated by both the examiners. Marks for each item theory, adjustment of apparatus, data recording, graph, calculation and accuracy of result must be shown separately. Total marks for experiment should also be shown on the back side of the cover page.

Marks distribution:

Laboratory Notebook—2

Experiment—13

If the candidate is found unable to write working formula, it may be supplied by the examiners but no mark on that head will be awarded. Proper handling of the instruments setting of the apparatus and systematic recording of data should be taken into account while allotting marks for systematic recording of data. Marks for accuracy are to be awarded on the basis of the correct result, calculated by the examiners.

Special instruction for different experiments:

Experiment No. 3 : Supplied data— Thickness of experimental sheet, Mass and Specific heat of the lower disc.

SH-III/Physics/302/C-6(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32422 **Course Code : SHPHS/302/C-6(P)**

Course Title : Thermal Physics Lab

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

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

(One experiment is to be performed)

1. Determine the mechanical equivalent of J, by Calendar and Barne's constant flow method. (Take reading for two different currents. Resistance of the potentiometer wire to be supplied.

(a) Definition of the quantities to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling 1

Data Recording

(d) Recording of heating current. 1·5×2=3

(e) Measurement of rate of water flow. 1·5×2=3

(f) Other records (Temperature difference, voltmeter reading etc) 2

(g) Calculation. 1

(h) Accuracy. 1

2. Determine the coefficient of thermal conductivity of Cu by Searle's Apparatus. (Diameter and length of the bar to be supplied)

(a) Definition of the quantities to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

Data Recording

(c) Reading of temperature during variable and steady state 4

(d) Mass of water collected per second at steady state. 4

(e) Recording of barometer reading. 1

(f) Calculation. 1

(g) Accuracy. 1

3. Determine the coefficient of thermal conductivity of bad conductor by Lee and Charlton's method. (Thickness and radius of the experimental sheet, mass and specifc heat of the lower disc are to be supplied)

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

Data Recording

(c) Time-temperature recording for steady state. 3

(d) Time-temperature recording for cooling. 4

(e) Cooling curve. 2

(f) Calculation. 1

(g) Accuracy. 1

4. Determine the temperature coefficient of resistance by platinum resistance thermometer.

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling. 1

Data Recording

(d) Electrical mid point of the bridge wire. 1

(e) Recording of null points when thermometer is kept in

(i) room temperature 3½

(ii) Steam 3½

(f) Calculation. 1

(g) Accuracy. 1

5. Study the variation of thermo emf of a thermocouple with difference of temperature of its two junctions. [Resistance of the potentiometer to be supplied]

(a) Definition of the quantity to be determined. 1

(b) Theory (working formula with explanation of symbols) 1

(c) Circuit diagram with labelling. 1

Data Recording

(d) Data for null point 5

(e) Graph 3

(f) Calculation. 1

(g) Accuracy. 1

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B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32422 **Course Code : SHPHS-302C-6(PI)**

Course Title : Thermal Physics Lab

Instruction to the Examiner.

The Examiners are requested to paste one question on a card with respective serial number of the question. Cards may be duplicated, but the total number of cards may exceed the number of examinees. A list of arranged experiment sets signed by both the examiners along with answer script packet should be sent to the University. In no case, Examination will be conducted by the Examiner alone. Secrecy of the result must be maintained.

Each candidate should perform the experiment which is noted on the card drawn by him/her. The examiners may, however, use their discretion in offering him/her a second chance only after drawing card by all candidates. The Laboratory Notebook must be submitted by the candidates before drawing of the card. **No credit should be given to Notebook which has not been signed.**

Candidates are required to write down the questions on one answer-script with respective number of the questions and return the card to the examiner. Candidates will first write down the theory (only for working formula explaining the symbol used) in presence of examiners and get them signed by either of the examiners.

Examiners are requested to see that the candidates are working according to instruction and to sign some important data for the experiment. Each answer script should be examined jointly by the Internal and External Examiner and should bear the signature of both examiners. All changes must be initiated by both the examiners. Marks for each item theory, adjustment of apparatus, data recording, graph, calculation and accuracy of result must be shown separately. Total marks for experiment should also be shown on the back side of the cover page.

Marks distribution:

Laboratory Notebook—2

Experiment—13

If the candidate is found unable to write working formula, it may be supplied by the examiners but no mark on that head will be awarded. Proper handling of the instruments setting of the apparatus and systematic recording of data should be taken into account while allotting marks for systematic recording of data. Marks for accuracy are to be awarded on the basis of the correct result, calculated by the examiners.

Special instruction for different experiments:

Experiment No. 3 : Supplied data— Thickness of experimental sheet, Mass and Specific heat of the lower disc.

SH-III/Physics/303C-7(P)/19

B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32423 **Course Code : SHPHS-303C-7(P)**

Course Title : Digital System and Application Lab

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Perform any one experiment.

1. Design a NOT gate using transistor and resistances on a bread-board. Calculate the maximum value of base resistance to fix the operating point on saturation region. Show that the circuit acts as a NOT gate.

(a) Theory 2

(b) Design 2

(c) Calculate of base resistance 3

(d) Experiment 6

2. Design and verify the truth tables of AND and OR gates using NAND gates.

(a) Theory 2

(b) Pin configuration 1

(c) Design 4

(d) Verification of truth table 6

3. Design and verify the truth tables of NOT and X-OR gates using NAND gates.

(a) Theory 2

(b) Design 4

(c) Pin configuration 1

(d) Experiment 6

4. The truth table of a digital circuit is given below:

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

Design a combinational logic circuit (using NAND gates) from the given truth table. Experimentally verify the truth table in your circuit.

(a) Theory 2

(b) Pin configuration of IC 7400 1

(c) Circuit diagram 1

(d) Design 4

(e) Verification 5

5. The Boolean expression for output of a combinational digital circuit is $Y = \bar{A}BC + A\bar{B}C + AB\bar{C}$.

Construct a circuit using the Boolean expression. Write the truth table of the circuit and verify it experimentally. You may use basic gates.

(a) Theory 2

(b) Circuit diagram 1

(c) Design 4

(d) Verification of truth table 6

6. Design a half adder circuit on a bread board using NAND gates. Verify its truth table.

(a) Theory 2

(b) Pin configuration 1

(c) Design 4

(d) Verification of truth table 6

7. Design a full adder circuit using two half adders and an OR gate. Verify its truth table for sum and carry. You may use X-OR gates.

(a) Theory 2

(b) Design 4

(c) Verification of truth table 7

8. Two bits binary numbers are given below:

A = 1 1

B = 1 0

Construct a combinational circuit to add these numbers. Show that the output states follow the binary addition of A and B. You may use X-OR gates to construct the circuit.

(a) Theory 2

(b) Circuit diagram 1

(c) Design 5

(d) Verification of truth table 5

9. Design a half subtractor circuit on a bread board using NAND gates. Verify its truth table.

(a) Theory 2

(b) Pin configuration 1

(c) Design 4

(d) Verification of truth table 6

10. Design a full subtractor circuit and verify its truth table.

(a) Theory 2

(b) Design 4

(c) Verification of truth table 7

11. Design a 3-bit adder subtractor circuit on bread board using full adder IC. Verify the circuit with two 3 bits binary numbers.

A = 110

B = 101

(a) Theory 2

(b) Circuit diagram 2

(c) Design 4

(d) Verification of truth table 5

12. Design and verify the truth tables of RS and clocked RS flip-flops using NAND gates only.

(a) Theory 2

(b) Pin configuration 1

(c) Design 4

(d) Verification of truth table 6

13. Design and verify the truth tables of JK flip-flops using NAND gates.

(a) Theory 2

(b) Pin configuration 1

(c) Design 4

(d) Verification of truth table 6

14. Design an astable multivibrator using 555 timer IC and related components. Find the theoretical value of duty cycle and verify it experimentally.

(a) Theory 2

(b) Design 4

(c) Verification of truth table 7

15. Design a monostable multivibrator using 555 timer IC and related components. Study its output waveform in CRO and find the period of positive part of the output waveform

(a) Theory 2

(b) Design 4

(c) Verification of truth table 7

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B.Sc. Semester III (Honours) Examination, 2018-19

PHYSICS

Course ID : 32423 **Course Code : SHPHS-303C-7(P)**

Course Title : Digital System and Application Lab

Instruction to Examiners

The examiners are requested to paste one question on a card with respective serial number of the question. Cards may be duplicated, but the total number of cards may exceed the number of examinees. A list of arranged experiment sets signed by both the examiners along with answer script packet should be sent to The University. In no case, Examination will be conducted by the Examiner alone. Secrecy of the result must be maintained.

Each candidate should perform the experiment which is noted on the card drawn by him/her. The examiners may, however, use their discretion in offering him/her a second chance only after drawing card by all the candidates. The Laboratory Notebook must be submitted by the candidates before drawing of the card. **No credit should be given to Notebook which has not been signed.**

Candidates are required to write down the questions on one answer-script with respective number of the questions and return the card to the examiner. Candidates will first write down the theory (only for working formula explaining the symbol used) in presence of examiners and get them signed by either of the examiners.

Examiners are requested to see that the candidates are working according to instruction and to sign some important data for the experiment. Each answer script should be examined jointly by the Internal and External Examiner and should bear the signature of both examiners. All changes must be initiated by both the examiners. Marks for each item theory, adjustment of apparatus, data recording, graph, calculation and accuracy of result must be shown separately. Total marks for experiment should also be shown on the back side of the cover page.

Marks distribution	Laboratory Notebook-	2
	Experiment -	13

If the candidate is found unable to write working formula, it may be supplied by the examiners but no mark on that head will be awarded. Proper handling of the instruments, setting of the apparatus and systematic recording of data should be taken into account while allotting marks for systematic recording of data.

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SP-III/Physics-301C-1C(P)/19

B.Sc. Semester III (Programme) Practical Examination, 2018-19

PHYSICS

Course ID : 32428 **Course Code : SPPHS-301C-1C(P)**

Course Title : Optics and Modern Physics Lab

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

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

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি পূর্ণমান নির্দেশক।
পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

(Answer any one question)

1. Adjust the spectrometer for parallel rays by Schuster method and determine the angle of the given prism.

(সুস্টার পদ্ধতিতে বর্ণালী বিক্ষণযন্ত্রের সমন্বয় করো এবং প্রিজমের প্রতিসারক কোণ নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

2. Determine the refractive index of the material of a given prism using sodium light. Angle of the prism to be supplied.

(সোডিয়াম আলোক উৎসের সাহায্যে প্রদত্ত প্রিজমের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

3. Determine the dispersive power of the material of a given prism using polychromatic light. Angle of the prism to be supplied.

(বহুবর্ণী আলোক উৎসের সাহায্যে প্রদত্ত প্রিজমের উপাদানের বিচ্ছুরণ ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording (for two different wavelengths)-03+03	01	01

4. Determine the resolving power of a given prism. Angle of the prism, base width of the prism and required wavelengths of the lines to be supplied.

(প্রদত্ত প্রিজমের বিশ্লেষণী ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

5. Determine the wavelength of sodium light using Newton's rings. The radius of curvature of the lower surface of the lens to be supplied.

(নিউটন রিং-এর সাহায্যে সোডিয়াম আলোর উৎসের তরঙ্গ দৈর্ঘ্য নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Adjustment of the travelling microscope-01 Vernier constant-01 Data recording-06 Graph-02	01	01

6. Determine the resolving power of a plane diffraction grating. No. of rulings per unit length of the grating to be supplied.

(অপবর্তন গ্রেটিং-এর বিশ্লেষণী ক্ষমতা বাহির করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Setting the grating surface normal to incident beam-01 Vernier constant-01 Data recording-05	01	01

7. Determine the value of Boltzmann constant using V-I characteristic of PN diode. Maximum allowable current through the diode to be supplied.

(PN ডায়োডের বিভবপ্রভেদ-তড়িৎপ্রবাহ লেখো। বৈশিষ্ট লেখো-এর সাহয্যে বোল্‌ৎস্‌ম্যান ধ্রুবকের মান নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Circuit diagram-02 Data recording-05 Graph-02	01	01

8. The determine work function of material of filament of directly heated vacuum diode. Filament current vs. filament temperature data to be supplied.

(বায়ুশূন্য ডায়োডের ফিলামেন্টের উপাদানের কার্যআপেক্ষক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Circuit diagram-02 Data recording-05 Graph-02	01	01

9. Determine the value of Planck's constant using LEDs of at least 4 different colours. Wavelengths of the emitted light for the LEDs to be supplied.

(কমপক্ষে চারটি ভিন্ন বর্ণের এল্. ই. ডি (LED)-এর সাহায্যে প্লাঙ্কের ধ্রুবকের মান নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	Circuit diagram-02 Data recording-05 Graph-02	01	01

10. Determine the refractive index of water by a travelling microscope. Take at least two different depths of the water.

(চলমান অণুবিক্ষণযন্ত্রের সাহায্যে জলের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Vernier constant-01 Data recording-04+04	01	01

11. Determine the refractive index of the material of a lens by lens-mirror method.

(উত্তল লেন্স ও সমতল দর্পণের সাহায্যে লেন্সের উপাদানের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Radius of curvature-03 Focal length-06	01	01

12. Determine the refractive index of the liquid by lens-mirror method.
(উত্তল লেন্স ও সমতল দর্পণের সাহায্যে প্রদত্ত তরলের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Radius of curvature-03 Focal length of convex lens-03 Focal length of lens combination-03	01	01

13. Determine the focal length of a concave lens by combination method and calculate its power. Take at least three sets of readings in both cases for the convex lens as well as for the combination.
(সমবায় পদ্ধতিতে একটি অবতল লেন্সের ফোকাস দৈর্ঘ্য ও ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Focal length of convex lens-04 Focal length of lens combination-04	01+01	01

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B.Sc. Semester III (Programme) Practical Examination, 2018-19

PHYSICS

Course ID : 32428 Course Code : SPPHS-301C-1C(PI)

Course Title : Optics and Modern Physics Lab.

Instructions to examiner

1. **Setting up the experiments:**
   Examiners are requested to paste one question with respective serial number on one card. The cards may be duplicated and the total number of cards may exceed the total number of candidates. A list of experiment set signed by the examiners should be sent along with the answer sheets. The examination must be conducted in presence of both the internal and external examiners.

2. **Drawing of cards:**
   The candidates should draw a card for his/her experiment and in case of his inability to perform the experiment, he may be given a second chance only after drawing of cards by all the other candidates is over. The candidates are required to write down their question on the first page of their answer sheet and return the cards to the examiner.

3. **Submission of Laboratory Notebook (LNB):**
   The candidates should submit their LNB before drawing of the cards. No marks should be awarded if LNBs are not submitted or not regularly signed by the teachers.

4. **Supervision of the Theory/Data:**
   The candidates will first write down the theory and necessary diagrams (if required) and get them signed by any one of the examiners. The examiners are requested to check at least one data during experiment and sign thereof. Marks should be deducted for any mistakes committed by the candidate during experiment. Special credit should be given to the candidate depending upon his/her overall performance.

5. **Evaluation of the answer script:**
   Both the examiners should jointly examine the answer scripts. Both the examiners should put their signatures. Marks for each item such as definition, theory, recording of data, graph, calculation, accuracy etc., should be shown at the back side of the cover page of the answer script. Systematic recording of data in tabular form with proper column heads and proper units should be the main criteria for awarding marks.

6. **Distribution of marks:**
   Experiment-13
   LNB-02
   Total=15

SP-III/Physics-304SEC-1(T)/19

B.Sc. Semester III (Programme) Examination, 2018-19

PHYSICS

Course ID : 32410 **Course Code : SPPHS-304SEC-1(T)**

Course Title : Renewable Energy and Energy Harvesting (SEC-T2)

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.

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

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি পূর্ণমান নির্দেশক।
পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

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

যেকোনো পাঁচটি প্রশ্নের উত্তর দাও।

(a) What is Geothermal energy?
জিওথার্মাল শক্তি কী?

(b) Mention the limitations of use of fossil fuels.
জীবাশ্ম জ্বালানি ব্যবহারের সীমাবদ্ধতাগুলি উল্লেখ করো।

(c) Name four thermal Power Plants in West Bengal.
পশ্চিমবঙ্গের চারটি তাপবিদ্যুৎ কেন্দ্রের নাম লেখো।

(d) Mention some applications of solar cells.
সৌরকোষের কয়েকটি ব্যবহার বলো।

(e) Why do we need renewable energy?
পুনর্নবিকরণযোগ্য শক্তির প্রয়োজনীয়তা কী?

(f) What is photovoltaic effect?
ফটোভোলটাইক প্রভাব কী?

(g) What are the sources of nuclear energy?
পারমাণবিক শক্তির উৎস কী কী?

(h) What does ocean thermal power mean?
মহাসাগরীয় তাপশক্তি বলতে কী বোঝো?

2. Answer *any four* of the following: 5×4=20

যেকোনো চারটি প্রশ্নের উত্তর দাও।

(a) What is the importance of solar energy? What are the factors that may influence the solar energy operated device? 3+2=5
সৌরশক্তির প্রয়োজনীয়তা কী? সৌরশক্তি চালিত যন্ত্রের উপর প্রভাব বিস্তারকারী রাশিগুলি কী?

(b) What are the different methods to harvest wind energy? What is solar cooker? 4+1=5
বায়ুশক্তি ব্যবহারের বিভিন্ন পদ্ধতি কী কী? সৌরকুকার কী?

(c) What are the advantages and disadvantages of non-conventional sources of energy? What do you mean hydropower? 4+1=5

অপ্রচলিত শক্তি উৎসের সুবিধা ও অসুবিধাগুলি উল্লেখ করো। জলবিদ্যুৎ কী?

(d) What do you mean by piezoelectric parameters? Write the application of piezoelectric harvesting. 3+2=5

Piezoelectric স্থিতিমাপ বলতে কী বোঝো? Piezoelectric ফসলের প্রয়োগ লেখো।

(e) What are the advantages and disadvantages of use of nuclear sources of energy? What is solar pond? 3+2=5

পারমাণবিক শক্তি ব্যবহারের সুবিধা এবং অসুবিধাগুলি উল্লেখ করো। সৌর পুকুর কী?

(f) Explain the operation of photo-voltaic cell. How Piezoelectricity work? 3+2=5

ফটোভোল্টায়িক কোষ কীভাবে কাজ করে ব্যাখ্যা করো। Piezoelectric কীভাবে কাজ করে বলো।

3. Answer any one question: 10×1=10

যেকোনো একটি প্রশ্নের উত্তর দাও।

(a) What do you mean by ocean wave energy? What are the technologies used to obtain tidal energy? Write the different types of geothermal resources. 3+3+4=10

সমুদ্র তরঙ্গ শক্তি বলতে কী বোঝো? জোয়ার শক্তি অর্জন করতে ব্যবহৃত প্রযুক্তি কী কী? বিভিন্ন ধরনের ভূ-তাত্ত্বিক সম্পদগুলি লেখো।

(b) Briefly Explain the different types of renewable sources of energy. What is sun tracking system? 8+2=10

বিভিন্ন প্রকার নবীকরণযোগ্য শক্তির উৎসগুলি সংক্ষিপ্ত আকারে লেখো। সূর্য ট্র্যাকিং সিস্টেম কী?

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SH-III/Physics-304GE-3(P)/19

B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32424 **Course Code : SHPHS-304GE-3(P)**

Course Title : Physical Optics and Modern Physics Lab (GE-P3)

Time: 2 Hours **Full Marks: 15**

The figures in the margin indicate full marks.

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

দক্ষিণ প্রান্তস্থ সংখ্যাগুলি পূর্ণমান নির্দেশক।
পরীক্ষার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

(Answer any one question)

1. Adjust the spectrometer for parallel rays by Schuster method and determine the angle of the given prism.

(সুস্টার পদ্ধতিতে বর্ণালী বিক্ষণযন্ত্রের সমন্বয় করো এবং প্রিজমের প্রতিসারক কোণ নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

2. Determine the refractive index of the material of a given prism using sodium light. Angle of the prism to be supplied.

(সোডিয়াম আলোক উৎসের সাহায্যে প্রদত্ত প্রিজমের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

3. Determine the dispersive power of the material of a given prism using polychromatic light. Angle of the prism to be supplied.

(বহুবর্ণী আলোক উৎসের সাহায্যে প্রদত্ত প্রিজমের উপাদানের বিচ্ছুরণ ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording (for two different wavelengths)-03+03	01	01

4. Determine the resolving power of a given prism. Angle of the prism, base width of the prism and required wavelengths of the lines to be supplied.

(প্রদত্ত প্রিজমের বিশ্লেষণী ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Vernier constant-01 Data recording-06	01	01

5. Determine the wavelength of sodium light using Newton's rings. The radius of curvature of the lower surface of the lens to be supplied.

(নিউটন রিং-এর সাহায্যে সোডিয়াম আলোর উৎসের তরঙ্গ দৈর্ঘ্য নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Adjustment of the travelling microscope-01 Vernier constant-01 Data recording-06 Graph-02	01	01

6. Determine the resolving power of a plane diffraction grating. No. of rulings per unit length of the grating to be supplied.

(অপবর্তন গ্রেটিং-এর বিশ্লেষণী ক্ষমতা বাহির করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Levelling and focusing for parallel rays-02 Setting the grating surface normal to incident beam-01 Vernier constant-01 Data recording-05	01	01

7. Determine the value of Boltzmann constant using V-I characteristic of PN diode. Maximum allowable current through the diode to be supplied.

(PN ডায়োডের বিভবপ্রভেদ-তড়িৎপ্রবাহ লেখো। বৈশিষ্ট লেখো-এর সাহয্যে বোল্‌ৎস্‌ম্যান ধ্রুবকের মান নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
02	Circuit diagram-02 Data recording-05 Graph-02	01	01

8. The determine work function of material of filament of directly heated vacuum diode. Filament current vs. filament temperature data to be supplied.

(বায়ুশূন্য ডায়োডের ফিলামেন্টের উপাদানের কার্যআপেক্ষক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Circuit diagram-02 Data recording-05 Graph-02	01	01

9. Determine the value of Planck's constant using LEDs of at least 4 different colours. Wavelengths of the emitted light for the LEDs to be supplied.

(কমপক্ষে চারটি ভিন্ন বর্ণের এল্. ই. ডি (LED)-এর সাহায্যে প্লাঙ্কের ধ্রুবকের মান নির্ণয় করো।)

Distribution of marks:

Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	Circuit diagram-02 Data recording-05 Graph-02	01	01

10. Determine the refractive index of water by a travelling microscope. Take at least two different depths of the water.

(চলমান অণুবিক্ষণযন্ত্রের সাহায্যে জলের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Vernier constant-01 Data recording-04+04	01	01

11. Determine the refractive index of the material of a lens by lens-mirror method.

(উত্তল লেন্স ও সমতল দর্পণের সাহায্যে লেন্সের উপাদানের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Radius of curvature-03 Focal length-06	01	01

12. Determine the refractive index of the liquid by lens-mirror method.
(উত্তল লেন্স ও সমতল দর্পণের সাহায্যে প্রদত্ত তরলের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Radius of curvature-03 Focal length of convex lens-03 Focal length of lens combination-03	01	01

13. Determine the focal length of a concave lens by combination method and calculate its power. Take at least three sets of readings in both cases for the convex lens as well as for the combination.
(সমবায় পদ্ধতিতে একটি অবতল লেন্সের ফোকাস দৈর্ঘ্য ও ক্ষমতা নির্ণয় করো।)

Distribution of marks:

Definition of the quantity to be measured	Working formula with symbols explained	Systematic recording of data and performance	Calculation	Accuracy
01	01	Data recording for Focal length of convex lens-04 Focal length of lens combination-04	01+01	01

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B.Sc. Semester III (Honours) Practical Examination, 2018-19

PHYSICS

Course ID : 32424 Course Code : SHPHS-304GE-3(PI)

Course Title : Physical Optics and Modern Physics Lab

Instructions to examiner

1. **Setting up the experiments:**
   Examiners are requested to paste one question with respective serial number on one card. The cards may be duplicated and the total number of cards may exceed the total number of candidates. A list of experiment set signed by the examiners should be sent along with the answer sheets. The examination must be conducted in presence of both the internal and external examiners.

2. **Drawing of cards:**
   The candidates should draw a card for his/her experiment and in case of his inability to perform the experiment, he may be given a second chance only after drawing of cards by all the other candidates is over. The candidates are required to write down their question on the first page of their answer sheet and return the cards to the examiner.

3. **Submission of Laboratory Notebook (LNB):**
   The candidates should submit their LNB before drawing of the cards. No marks should be awarded if LNBs are not submitted or not regularly signed by the teachers.

4. **Supervision of the Theory/Data:**
   The candidates will first write down the theory and necessary diagrams (if required) and get them signed by any one of the examiners. The examiners are requested to check at least one data during experiment and sign thereof. Marks should be deducted for any mistakes committed by the candidate during experiment. Special credit should be given to the candidate depending upon his/her overall performance.

5. **Evaluation of the answer script:**
   Both the examiners should jointly examine the answer scripts. Both the examiners should put their signatures. Marks for each item such as definition, theory, recording of data, graph, calculation, accuracy etc., should be shown at the back side of the cover page of the answer script. Systematic recording of data in tabular form with proper column heads and proper units should be the main criteria for awarding marks.

6. **Distribution of marks:**
   Experiment-13
   LNB-02
   Total=15