# B.Sc. 3rd Semester (Honours) Examination, 2019-20 <br> PHYSICS 

Course ID : 32412

## Course Code : SH/PHS-302-C-6

## 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.

1. Answer any five questions:
(a) State the zeroth law of thermodynamics.
(b) State with reasons whether internal energy is a state function or a path function.
(c) Assuming ideal gas behaviour estimate the number of moles in $1 \mathrm{~m}^{3}$ of air under atmospheric pressure $\left(1 \cdot 014 \times 10^{5} \mathrm{~N} / \mathrm{m}^{2}\right)$ at $0^{\circ} \mathrm{C}$.
(d) What are the units of ' $a$ ' and ' $b$ ' in van der Waal's equation of state?
(e) Under what condition a real gas will behave as an ideal gas?
(f) What do you mean by "most probable velocity" of gas molecules?
(g) Define 'inversion temperature' in case of liquefaction of gases.
(h) What is meant by enthalpy of a system?

Answer any two of the following:
2. (a) Define isothermal bulk modulus.
(b) Find the work done by a perfect gas during adiabatic process.
(c) Prove that, the slope of adiabatic curve through a point in PV graph is $\gamma\left(=\frac{c_{p}}{c_{v}}\right)$ times the slope of isothermal curve through the same point.
3. (a) Prove the thermodynamic relation: $T d s=C_{v} d T+T\left(\frac{\partial P}{\partial T}\right)_{v} d V$.
(b) Calculate the change in entropy if 2 gm of ice melts into water at NTP. Latent heat of ice $=80 \mathrm{cal} / \mathrm{gm}$.
4. (a) Show that the probability of a gas molecule travelling a distance ' $x$ ' without suffering a collision is $e^{-\frac{x}{\lambda}}, \lambda$ being mean face path of the gas.
(b) The mean free path of molecules in a certain gas is 4.0 cm . How many out of 10,000 free paths are longer than 4.0 cm ?
$4+1=5$
5. (a) Explain the principle of cooling by the process of adiabatic demagnetization.
(b) Draw the P-V diagram for working of a reversible Carnot engine.

Answer any one question:
6. (a) Distinguish between reversible and irreverssible process.
(b) Prove the equivalence of Kelvin-Planck and Clausius statement of second law of thermodynamics.
(c) Show that entropy always increases in irreverssible process.
7. (a) Establish Maxwell velocity distribution formula-

$$
d n=n a^{3} e^{-b\left(u^{2}+v^{2}+w^{2}\right)} d u d v d w,
$$

where the symbols have their usual meanings.
(b) It $T_{c}, P_{c}$ and $V_{c}$ are the critical values of temperature, pressure and volume, respectively, of a gas and ' $a$ ', ' $b$ ' are the van der Waal's constants, then show that, $V_{c}=3 b, P_{c}=\frac{a}{27 b^{2}}$ and $T_{C}=\frac{8 a}{27 b R}$.
$6+4=10$

# B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS 

Course ID : 32422
Course Code : SHPHS/302/C-6

## 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
(b) Theory (working formula with explanation of symbols)
(c) Circuit diagram with labelling1

Data Recording
(d) Recording of heating current $1 \cdot 5 \times 2=3$
(e) Measurement of rate of water flow $1 \cdot 5 \times 2=3$
(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 specific 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 $31 / 2$
(ii) Steam $3 \frac{1 ⁄ 2}{2}$
(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

# B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS 

Course ID : 32422
Course Code : SH/PHS/302/C-6

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.

## B.Sc. 3rd Semester (Honours) Examination, 2019-20 <br> PHYSICS

Course ID : 32413
Course Code : SH/PHS/303/C-7

## Course Title: Digital System 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

## Answer any five of the following:

1. (a) Convert the hexadecimal number C5E2 into a binary number.
(b) Prove that $\overline{A B}+\bar{A}+A B=1$.
(c) Explain the term 'SISO' for a shift register.
(d) "A negative logic OR gate is equivalent to a positive logic AND gate"- Justify.
(e) A device is needed to monitor the simultaneous occurrence of low states in two separate lines and to produce a high output as an indication. What will be the device?
(f) Define linear ICs with example.
(g) Write two applications of 555 timer.
(h) Substract (12) $)_{10}-(21)_{10}$ using 2's complement method.

## Section-II

Answer any two questions: $\quad 5 \times 2=10$
2. (a) What do you mean by digital comparator?
(b) With truth table and proper explanation draw the circuit diagram of a single bit comparator.

$$
1+4=5
$$

3. Draw the circuit diagram of MSJK flip-flop using NAND gate only. Explain how can 'race around condition' can be solved using MSJK flip-flop. What is D-flip-flop? $1+3+1=5$
4. What is a Synchronous counter? What is its advantage over asynchronous counter? Draw the block diagram of a 3-bit synchronous counter and explain its operation.
$1+1+3=5$
5. Distinguish between OR and EX-OR gate. Why EX-OR gate is called a coincidence checker? How X-OR gate is converted into EX-NOR gate?

## Section-III

Answer any one question:
$10 \times 1=10$
6. (a) Draw a 8 word $\times 4$ bit ROM array using decoder and diodes. Explain its operation.
(b) With block diagram of full adder and EX-OR gates, draw a circuit of 4 bit adder substractor. Explain its operation.
$(2+4)+4=10$
7. (a) Draw a BCD to decimal decoder circuit and explain its operation.
(b) Show that $(A \oplus B) \oplus C=A \oplus(B \oplus C)$.
(c) Simplify the Boolean expression $Y=\bar{A} B C+A \bar{B} C+A B \bar{C}+A B C$ using Karnaugh Map.

## B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS

Course ID : 32423
Course Code : SH/PHS/303/C-7

## Course Title: Digital System and Applications Lab

Time: 2 Hours
Full Marks: 15

1. Using a transistor, colour-coded resistances and suitable dc power supply design a NOT gate on a bread-board. Note the input-output voltage and show that the circuit act as NOT gate. Repeat the experiment with another transistor.

## Marks Distribution:

Theory : 02; Design : 02+02; Experiment : 07
2. Design and verify the truth tables of AND and OR gates using NAND gates.

## Marks Distribution:

Theory : 03; Pin configuration of NAND gate IC : 01;
Design : 03; Verification of truth tables : 06.
3. Design and verify the truth tables of NOT and EX-OR gates using NAND gates.

## Marks Distribution:

Theory : 03; Pin configuration of NAND gate IC : 01;
Design : 03; Verification of truth tables : 06.
4. The truth table of logic circuit is given below

| $A$ | $B$ | $Y$ |
| :--- | :--- | :--- |
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Design a logic circuit from the truth table and using NAND gates only. Verify the given truth in your circuit by measuring input-output voltages.

## Marks Distribution:

Theory: 02; Pin configuration of NAND gate IC : 01;
Circuit diagram : 01; Design : 04; Verification of truth table : 05
5. The Boolean expression for output of a logic circuit is $Y=\bar{A} \bar{B}+A B$. Construct a logic circuit using NAND gates only. Write the truth table of the given equation and verify it experimentally.

## Marks Distribution:

Theory : 02; Pin configuration of NAND gate IC : 01;
Circuit diagram : 01, Design : 04; Verification : 05.
6. Design a Half Adder circuit on a bread-board using NAND gates only. Verify its truth table by measuring input-output voltages.

## Marks Distribution:

Theory : 03; Pin configuration of NAND gate IC : 01;
Design : 04; Verification of truth tables : 05 .
7. Design a Full Adder logic circuit using two Half Adders and OR gate. Verify the truth tables of the circuit by measuring input-output voltages. You may use any type of gates.

## Marks Distribution:

Theory : 02; Circuit diagram : 01,
Design : 04; Verification of truth tables : 06 .
8. Construct a combinational logic circuit to add two binary numbers $\mathrm{A}=10$ and $\mathrm{B}=11$. Experimentally verify the truth tables. You may use EX-OR gates.

## Marks Distribution:

Theory : 02; Circuit diagram : 02, Design : 04; Verification : 05 .
9. Design a Half Substractor circuit on bread-board using NAND gates only. Experimentally verify its truth tables.

## Marks Distribution:

Theory : 02; Pin configuration of NAND gate IC : 01;
Design : 04; Verification : 06.
10. Design and verify the truth tables of a Full Substractor circuit. You may use EX-OR and basic gates.

## Marks Distribution:

Theory : 03; Design : 05; Verification of truth tables : 05 .
11. Design a - 2 - bit Adder - Substractor circuit on a bread-board by using Full Adder IC and EX-OR gates. Verify the truth table of Your circuit using 2-binary numbers $\mathrm{A}=11$ and $\mathrm{B}=10$.

## Marks Distribution:

Theory : 02; Circuit diagram : 02; Design : 04;
Verification: 05 .
12. Design and Verify the truth tables of RS and D-type Flip-Flops using NAND gates only.

## Marks Distribution:

Theory: 03; Pin configuration of NAND gate IC : 01;
Design : 04; Verification : 05.
13. Design and Verify the truth tables of a clocked RS Flip-Flops using NAND gates only.

## Marks Distribution:

Theory : 02; Pin configuration of NAND gate IC : 01;
Design : 04; Verification : 06.
14. Design and Verify the truth tables of a JK Flip-Flop using NAND gates only.

## Marks Distribution:

Theory: 02; Pin configuration of NAND gate IC : 01;
Design : 04; Verification : 06.
15. Design an a stable multivibrator using 555 timer IC and related components. Find the theoretical value of duty cycle and verify it experimentally.

## Marks Distribution:

Theory : 02; Design : 03; Adjustment in CRO : 03; Experimental Verification : 05.
16. Design a monostable multivibrator using 555 timer IC and related components. Study its output wave form using CRO and period of positive part of output wave form.

## Marks Distribution:

Theory : 02; Design : 03; Adjustment in CRO : 03; Experiment : 05.

# B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS 

## Course Title: Digital System and Application Lab

## Instruction to the Examiner.

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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 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 theory, 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.

## Special instructions for different experiments:

1. All the experiments should be done on bread board, in no way fabricated board can be used.
2. High and low values of the voltages in Truth Tables must be checked by the examiners and put sign on important data in Truth Table.
3. Examiners are requested to check the construction of digital circuits prepared by the candidates and to put a comment on answer script "construction is done by the candidate".

## B.Sc. 3rd Semester (Honours) Examination, 2019-20 PHYSICS

## Course ID : 32414

## Course Code : SH/PHS/304/GE-3

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 সংখ্যাঞ্ণলি প্রশ্নের পৃণমানের নির্দেশক।
পরীহ্থার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

## Section-I

1. Answer any five questions:

यে কোনো পাঁচটি প্রশ্নের উত্তর দাও :
(a) Define Interference.

ব্যতিচারের সংজ্ঞা দাও।
(b) What is Nuclear Fission?

নিউক্লিয় বিয়োজন বলতে कী বোবো?
(c) Write down the time dependent Schrödinger Equation.

সময় নির্ভর শ্রেডিংগার সমীকরণটি লেতো।
(d) Define plane polarized light.

সমতল সমবর্তিত আলোর সংঞ্ঞা দাও।
(e) What do you mean by Nuclear Binding Energy?

নিউক্লিয়াসের বন্ধনশক্তি বলতে কী বোঝো?
(f) What do you mean by "Stopping Potential" in photo-electric effect?

আলোক তড়িৎ ক্রিয়ার ক্ষেত্রে বিরাম বিভব বলতে কী বোরো?
(g) State Moseley's law?

মোজলের সূত্রটি বিবৃত করো।
(h) Why X-ray is used in Crystal structure study?

কেলালের গঠন জনতত X-রশ্মি ব্যবহার করা হয় কেন?

## Section-B

Answer any two questions
$5 \times 2=10$
2. Draw a ray diagram of interference by Fresnel biprism and explain the principle to determine unknown wavelength.

রশ্মি চিত্রের সাহায্যে ব্যতিচারের গঠন দেখাও ফ্রেনেলের দ্বিপ্রিজম ব্যবস্থায় এবং অজ্ঞাত তরঙ্গদৈর্ঘ্য নির্ণয়ের কার্যনীতিটি ব্যাখ্যা করো।
3. Find out the expression of Intensity of a single slit diffraction pattern.

একরেখাছিদ্র ব্যবস্থ্যায় অপবর্তন pattern-এর তীব্রতার রাশিমালাটি নির্ণয় করো।
4. Write down the Haisenberg uncertainity principle. Using uncertainity principle, explain the nonexistance of electron inside the nucleus.
হাইসেনবার্গের অনিশ্চয়তা সূত্রটি লেখো। এই সূত্র ব্যবহার করে দেখাও যে নিউক্লিয়াসের ভিতরে ইলেকট্রন থাকতে পারে না।
5. Derive Bragg's law in Crystallography.

কেলাসবিদ্যায় ব্রাগের সূত্রটি প্রতিষ্ঠা করো।

## Section-C

Answer any one question
$10 \times 1=10$
6. What are the Eigen function and Eigen values? What do you mean by normalisation of a wave function? Determine the wavelength associated with an electron having kinetic energy equal to ' 1 ' MeV (use relativisite equation). What was de-Broglie hypothesis regarding matter waves?

$$
11 / 2+1^{1} / 2+2+4+1
$$

সংজ্ঞা দাও — Eigen function ও Eigen values। Wave function-এর ক্ষেত্রে 'Normalisation' বলতে কী বোবো? 1 MeV গতিশক্তি সম্পন্ন ইলেকট্টনের সাথে জড়িত তরঙ্গদৈর্ঘ্যটি নিরয় করো। (আপেক্ষিকতাবাদের সমীকরণটি ব্যবহার করো)। বস্তু তরঙ্গ সম্পর্কিত de-Brglie Hypothesis-টি উল্লেখ করো।
7. What do you mean by packing fraction of an atom and what is its importance? What do you mean by Nuclear Reactor and Nuclear Moderator? What substances are used as a Moderator in Nuclear Reactor? Briefly discuss about Nuclear Fussion.
$(1+1)+\left(1^{11 / 2}+1^{1} / 2+1\right)+4$ পরমাণুর ক্ষেত্রে Packing Fraction বলতে কী বোবো এবং এর গুরুত্ব কী? নিউক্লিয়ার রিঅ্যাকটর ও মডারেটর বলতে কী বোঝো? নিউক্লিয়ার রিঅ্যাকটের মডারেটর হিসাবে কোন পদার্থগুলি ব্যবহৃত হয় ? নিউক্লিয় সংযোজন সম্বন্ধে বিস্তারিতভাবে ব্যাখ্যা দাও।

## B.Sc. Semester III (Honours) Practical Examination, 2019-20 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 প্রাত্তস্থ সংখ্যাঞ্ণলি পৃণমান নির্দেশক। পরীষ্মা্থীদদর যথসম্ভব নিজজর ভাযায় 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 বণালী বিক্ষণযন্ত্রের সমন্বয় করো এবং প্রিজমের প্রতিসারক কোণ নির্ণয় করো।)

Distribution of marks:

| Working formula <br> with symbols <br> explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 02 | Levelling and focusing for parallel rays-02 <br> Vernier constant-01 <br> 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 প্রিজনের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured <br> sormula with <br> symbols <br> explained | Working <br> and performance | Systematic recording of data <br> folculation | Accuracy |  |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> 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 ক্মতা নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured <br> symbols <br> explained | Working <br> formula with <br> spatatation | Systematic recording of data <br> and performance | Calcularacy |  |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> Data recording (for two <br> 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 বিশ্লেযণী ক্ষমতা নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> 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 <br> with symbols <br> explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 02 | Adjustment of the travelling microscope-01 <br> Vernier constant-01 <br> Data recording-06 <br> 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.
(অপর্বতন গ্রেটিং-এর বিশ্লেযণী ক্মমতা বাহির করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Setting the grating surface <br> normal to incident beam-01 <br> Vernier constant-01 <br> 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 ডার্যোডের বিভবপ্রভেদ-অড়িৎপ্রবাহ লেতো। বৈশিষ্ট্য লেখ-এর সাহব্যে বোল্ৎস্ম্যান ধ্রবকেের মান নির্ণয় করো।)
Distribution of marks:

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

8. Determine the work function of material of filament of directly heated vacuum diode. Filament current vs. filament temperature data to be supplied.
(বায়ুশূন্য ডায়োডের ফিলামেন্টের উপাদানের কার্যঅাপেকক্কক নির্ণয় করো।)
Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Circuit diagram-02 <br> Data recording-05 <br> 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 সাহাব্যে প্লাক্কের ধ্রববকের মান নির্ণয় করো।)

Distribution of marks:

| Working formula with <br> symbols explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 01 | Circuit diagram-02 <br> Data recording-05 <br> 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 সাহাব্যে জলের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Vernier constant-01 <br> 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 <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Data recording for Radius of <br> curvature-03 <br> 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 <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Data recording for Radius of <br> curvature-03 <br> Focal length of convex lens-03 <br> Focal length of lens <br> 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 <br> quantity to be <br> measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Data recording for <br> Focal length of convex lens-04 <br> Focal length of lens <br> combination-04 | $01+01$ | 01 |

# B.Sc. 3rd Semester (Programme) Examination, 2019-20 PHYSICS 

Course ID : 32418
Course Code : SP/PHS/301/C-1C
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 সংখ্যাঞ্ণলি প্রশ্নের পৃণমানের নির্দেশক।
পরীক্থার্থীদের যथাসম্টব নিজের ভাষায় উত্তর দিতে হবে।

## Section-A

1. Answer any five of the following:

নিম্নলিখিত যে কোনো পাঁচটি প্রশ্নের উত্তর দাও :
(a) Why X-ray is used in crystal structure study?

কেলালের গঠন জননতে X-রশ্মি ব্যবহার করা হয় কেন?
(b) Why light is called an electromagnetic wave?

आলোককে তড়িৎহুম্বকীয় তরন্গ বলা হয় কেন ?
(c) What is Miller Indices?

মিলারের সূচক কী?
(d) What is Haidinger Fringe?

হেডিঞ্জার ঝালর কী?
(e) What is Nuclear Fusion?

কেন্দ্রক সংব্যোজন প্রক্রিয়া কী?
(f) What is Heisenberg Uncertainity Principle?

হাইলেনবা|্গ-এর অনিশয়তত সূত্রটি कী?
(g) What is Bragg's law?

ব্রাগের সূত্রটি লেখো।
(h) Determine the phase difference if the path differnce between two waves is $3 \lambda / 2$.

দুটি তরজ্গের পথ পার্থক্য $3 \lambda / 2$ হলে তাদের মধ্যে দশাপার্থক্য কত হবে?

## Section-B

Answer any two of the following:
যে কোনো দুটি প্রশ্নের উত্তর দাও :
2. What is diffraction grating? Discuss how a plane transmission grating forms its spectrum. $1+4=5$ অপবর্ত্ গ্রেটিং কী? একটি সমতল निঃসরণ গ্রেটিং কীভাবে বর্ণানो গঠন করে তা আলোচনা করো।
3. (a) What do you mean by reciprocal lattice?
'Reciprocal lattice' বলতে কী বোবো?
(b) Show that the volume of unit cell of the reciprocal lattice is inversely proportional to the volume of a unit cell of the crystal lattice.
$2+3=5$
দেখাও যে reciprocal lattice-এর একক কোশের আয়তন crystal lattice-এর একক কোশের আয়তনের সন্গে ব্যস্ত সম্পর্ক যুক্ত।
4. What are Mass defect and binding energy of nucleus? Establish the relation between Half Life and Average Life of a radioactive substance.
$2+3=5$ নিউক্লিয় ভর বিকৃতি ও নিউক্লিয় বন্ধনশক্তি কী? কোন তেজস্ক্রিয় পদার্থ্র অর্ধজীবনকাল ও গড় আয়ুক্কাল এর মধ্যে সম্পর্ক প্রতিষ্ঠা করো।
5. (a) Write down the time dependent and time independent schrodinger wave equations.

শ্রেডিংগারের সময়-সাপেক্ষ ও সময়-নিরপেক্ষ তরর্গ সমীকরণগুলি লেখো।
(b) What is the uncertainty in the velocity of an electron which is restricted to within a distance of $1 \mathrm{~A}^{\circ}$ ?
$1 A^{\circ}$ দূরত্বের মধ্যস্থিত কোনো ইলেকট্ট্রনের বেগের অনিশয়ততা কত হরে নিণত্য করো।

## Section-C

Answer any one of the following:
$10 \times 1=10$
নীচের যে কোনো একটি প্রশ্নের উত্তর দাও :
6. (a) Explain the formation of Newton's ring and derive an expression for the radius of $n$th dark ring.
নিউটন রিং-এর গঠনমূলক তত্̧টি ব্যাখ্যা করো এবং $n$-তম অন্ধকার রিং-এর ব্যাসার্ধের রাশিমালা নিণর্য় করো।
(b) The radius of curvature of a plane convex lens is 100 cm and radii of 5th and 15th dark rings are 0.336 cm and 0.59 cm respectively. Determine the wavelength of light used.

একটি সমতলোত্তল লেলেরের বক্রতা ব্যাসার্ধ 100 cm এবং পঞ্চ্ম ও পঞ্ধ্দশ অন্ধকার রিং-এর ব্যাসার্ধ গুলি যথাক্রুমে 0.336 cm এবং 0.59 cm হলেে ব্যবহৃত আলোর তরঙ্গদ̆র্ঘ্য নিণ্ণয় করো।
7. (a) What are the characteristics of wave function.

তরঙ্গ অপেক্ককের বৈশিষ্ট্যগুলি লেতো।
(b) What do you mean by normalised wave function?

Normalised তরন্গ অপেককক বলতে কী বোবো?
(c) The wave function of a particle in $n$th state lying in between $x=0$ and $x=\mathrm{a}$ is given by $\Psi_{n}=A \sin \frac{n \pi x}{a}$. Find the expression for the normalised wave function.

একটি কণা $x=0$ এবং $x=\mathrm{a}$ এর মব্যে অবস্থিত এবং তা $n$ তম-এর তরন্দ অপেক্ষক $\Psi_{n}=A \sin \frac{n \pi x}{a}$
হলে তার normalised তরগ্গ অপেক্কের রাশিমালা নির্ণয় করো।
(d) What is De-Broglie wave length?

ডি-ব্রগলি তরঞ্দদৈর্ঘ্য বলতে কী বোবো ?

## B.Sc. Semester III (Programme) Practical Examination, 2019-20 PHYSICS

Course ID : 32428

## Course Code : SP/PHS-301C/1C

## Course Title : Physics-III

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 পূণমান নিদ্দেশক। পরীক্ষার্থীদের যথাসভ্তব নিজের ভাযায় 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 বণালী বিক্ষণযন্ত্রের সমন্বয় করো এবং প্রিজমের প্রতিসারক কোণ নির্ণয় করো।)

Distribution of marks:

| Working formula <br> with symbols <br> explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 02 | Levelling and focusing for parallel rays-02 <br> Vernier constant-01 <br> 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 প্রিজনের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured <br> symbola with <br> symbols <br> explained | Working <br> and performance | Systematic recording of data <br> formalation | Accuracy |  |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> Data recording-06 | 01 | 01 |

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3. Determine the dispersive power of the material of a given prism using polychromatic light. Angle of the prism to be supplied.
(বহ্বর্ণী আলোক উৎলের সাহায্যে প্রদত্ত প্রিজমের উপাদানের বিচ্হুরণ কমতা নির্ণয় করো।)
Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> Data recording (for two <br> 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 বিশ্লেযণী ক্কমতা নিণর্য করো।)
Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Vernier constant-01 <br> 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 সাহয্যে সোডিয়াম আলোর উৎসের তরর দৈর্ঘ্য নির্ণয় করো।)
Distribution of marks:

| Working formula <br> with symbols <br> explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 02 | Adjustment of the travelling microscope-01 <br> Vernier constant-01 <br> Data recording-06 <br> 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.
(অপর্বতন গ্রেটিং-এর বিশ্লেযণী ক্মমতা বাহির করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Levelling and focusing for <br> parallel rays-02 <br> Setting the grating surface <br> normal to incident beam-01 <br> Vernier constant-01 <br> 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 লেতো। বৈশিষ্ট্য লেতো-এর সাহয্যে বোল্ৎ্ম্যান ধ্রববকের মান নির্ণয় করো।)
Distribution of marks:

| Working formula <br> with symbols <br> explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 02 | Circuit diagram-02 <br> Data recording-05 <br> 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 কার্যঅাপেকক্কক নির্ণয় করো।)
Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Circuit diagram-02 <br> Data recording-05 <br> 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 বর্ণ্ণর এল্. ই. ডি (LED)-এর সাशা্যে প্লাক্কের প্রুবকের মান নিণ্ৰয় করো।)

Distribution of marks:

| Working formula with <br> symbols explained | Systematic recording of data and <br> performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: |
| 01 | Circuit diagram-02 <br> Data recording-05 <br> 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 নিণত়় করো।)
Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Vernier constant-01 <br> 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 লেল্েের উপাদানের প্রতিসরাঙ্ক নির্ণয় করো।)

Distribution of marks:

| Definition of <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Data recording for Radius of <br> curvature-03 | 01 | 01 |
| Focal length-06 |  |  |  |  |$\quad$|  |
| :---: |

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 <br> the quantity to <br> be measured | Working <br> formula with <br> symbols <br> explained | Systematic recording of data <br> and performance | Calculation | Accuracy |
| :---: | :---: | :---: | :---: | :---: |
| 01 | 01 | Data recording for Radius of <br> curvature-03 <br> Focal length of convex lens-03 <br> Focal length of lens <br> 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 ক্ষমা নির্ণয় করো।)

Distribution of marks:

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

# B.Sc. Semester III (Programme) Practical Examination, 2019-20 PHYSICS 

Course ID : 32428
Course Code : SP/PHS-301C-1C
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

# B.Sc. 3rd Semester (Programme) Examination, 2019-20 PHYSICS 

## Course ID : 32410

Course Code : SP/PHS/304/SEC-1
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.

দক্মিণ প্র্তন্তস্থ সংখ্যাজুলি প্রশ্নের পূণমানের নির্দশক।
পরীহ্থার্থীদের যথাসম্ভব নিজের ভাষায় উত্তর দিতে হবে।

1. Answer any five of the following:

যে কোনো পাচটি প্রশ্নের উত্তর দাও :
(a) Mention the disadvantages of nuclear energy.

পারমাণবিক শক্তি ব্যবহারের অসুবিধাগুলি উল্লেখ করো।
(b) What is biogas?

জৈবগ্যাস कী?
(c) State few applications of solar photovoltaic system.

সোর ফোটোলোন্টাইক সমবায়ের কয়েকটি ব্যবহার উল্লেখ করো।
(d) What do you mean by tidal energy?

জোয়ার শক্তি বলতে কী বোরো?
(e) State few environmental problems associated with geothermal power plants.

জিওথার্মল শক্তি প্রকল্গের সন্দে সন্পর্কযুক্ত কয়েকটি পরিবেশগত সমস্যার উল্লেখ করো।
(f) What do you mean by piezoelectricity?

Piezoelectricity বলতত কী বোবো?
(g) What is hydraulic turbine?

হাইড্রলিক টারবাইন কী?
(h) Mention the problems associated with the ocean wave energy collection. সমুদ্রতরঙ্গ শক্তি আহরনের সঙ্দে সম্পর্কযুক্ত সমস্যাগুি উল্লেখ করো।
2. Answer any four of the followings:

যে কোনো চারটি প্রশ্নের উত্তর দাও :
(a) What is nuclear reactor? How energy is generated in a nuclear reactor? Explain. 1+4=5 নিউক্লিয় বিক্রিয়ক কী? একটি নিউক্লিয় বিক্রিয়কেকে কীভাবে শক্তি উৎপাদিত হয় তা আলোচনা করো।
(b) Describe briefly the construction and operation of a solar water heater.

একটি সৌর জল উত্তাপ করার যন্ত্রের গঠন ও কার্যপ্রণালী সংক্কেপে বর্ণনা করো।
(c) Discuss about the essential considerations to be made for selection of site for hydro-electric plant.
জলবিদ্যুৎ প্রকল্গের স্থান নির্বাচনের প্রধান শর্তগুলি সম্পর্কে আলোচনা করো।
(d) Classify geothermal resources. Mention few advantages and disadvantages of using geothermal energy.
জিওথার্মাল উৎসের শ্রেণিবিভাগ করো। জিওথার্মাল শক্তি ব্যবহারের কয়েকটি সুবিধা এবং অসুবিধা উল্লেথ করো।
(e) Describe the basic components of wind energy conversion system.

বায়ুশক্তি রূপান্তর সমবায়ের মূল অংশগুলি বর্ণনা করো।
(f) Write a short note on 'ocean thermal energy conversion'. সমুদ্রতাপ শক্তি রূপান্তরের উপর একটি সংক্ষিপ্ত টীকা লেখো।
3. Answer any one question: যে কোনো একটি প্রশ্নের উত্তর দাও :
(a) Give a brief description and principle of operation of a solar pond. Mention few applications of solar pond.
$(4+4)+2=10$
একটি সৌর পুকুরের বর্ণনা দাও এবং তার কার্যপ্রণালী আলোচনা করো। সৌর পুকুরের কর্যেকটি ব্যবহার উল্লেখ করো।
(b) Describe briefly the impact of conventional sources of energy on environment. Mention few merits and demerits of hydro-electric plants. What are the factors affecting ocean wave energy? $4+4+2=10$
পরিবেশের উপর প্রচলিত শক্তির উৎসগুলির প্রভাব সংক্ষেপপ বর্ণনা করো। জলবিদ্যুৎ প্রকল্গের কয়েকটি সুবিধা এবং অসুবিধা উল্লেখ করো। সমুদ্রতরঞ্গ শক্তির উপর প্রভাব বিস্তারকারী বিযয়গুলি কী কী?

# B.Sc. 3rd Semester (Programme) Examination, 2019-20 PHYSICS 

Course ID : 32410
Course Code : SP/PHS/304/SEC-1
Course Title: Computational Physics (SEC T1)
Time: 2 Hours
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.

1. Attempt any five questions:
(a) Describe the fortran statement IMPLICIT NONE.
(b) Draw the flowchart symbols for input, decision, process and connector.
(c) Write at least 2 standard data types in fortrain.
(d) Why it is necessary to declare the return type of a user defined function in fortran?
(e) Write Latex statement to generate table of contents in a Latex document.
(f) Give Latex code to write any two greek letters within a text line.
(g) Write gnuplot statements to put lables on the X and Y axis.
(h) Explain how gnuplot input file used for plotting.
2. Attempt any four questions:
(a) Draw a flow chart to read all elements of an array of real numbers of size.
(b) Write a program in fortran to read all elements of an array of real numbers of dimension $5 \times 5$ and find the average of all elements.
(c) Explain the syntax of goto statement in FORTRAN and describe its merits and drawbacks.
(d) Write the syntax of two Nested Block IF statement in FORTRAN. Give an example.
(e) Describe the advantages and disadvantages of Latex.
(f) Describe how to include graphics image files in Latex document.
3. Attempt any one question:
(a) Describe any five features of gnuplot. Describe the use of multiplot statement in gnuplot with examples.
$5+5=10$
(b) Explain how gnuplot input file is created. With the gnuplot statements involved in plotting $f(x)=\sin (5 x) / \sin (x)$ in the range $-2<x<2$ and saving the plot as .eps file. $5+5=10$

## B.Sc. 3rd Semester (Honours) Examination, 2019-20 <br> PHYSICS

Course ID : 32415
Course Code : SH/PHS/305/SEC-1
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:
(a) Name the four types of geothermal resources.
(b) What is tilt factor?
(c) What do you mean by anaerobic digestion?
(d) Name four thermal power plants in our State.
(e) Give some application of solar cells.
(f) Give two examples of fossil fuels.
(g) What is solar pond?
(h) What is piezoelectric effect?
2. Answer any four questions:
(a) What are the factors that may influence the efficiency of solar energy operated devices. Name some solar energy operated devices.
(b) What is meant by electromechanical coupling factor? What are the series and parallel resonance frequencies of a piezoelectric plate soldered at two faces?
(c) Discuss how the tidal energy can be utilized as renewable energy source.
(d) What do you mean by the non-conventional energy sources? Give examples of some nonconventional energy sources.
(e) Explain with a circuit diagram how an array of solar cells can be used as a battery charger. 5
(f) Mention the essential components of hydroelectric power plant. Draw a flow chart for such a plant.
3. Answer any one question:
$10 \times 1=10$
(a) What is the basic principle of ocean thermal energy conversion? Discuss various methods of fidal power generation in brief. What are the limitations of each method?
$2+6+2=10$
(b) What is biomass energy? Why biomass based energy options should receive priority over other options? What is the potential in India for biomass-based system? $2+4+4=10$

## B.Sc. 3rd Semester (Honours) Examination, 2019-20 PHYSICS

Course ID : 32415
Course Code : SH/PHS/305/SEC-1

## 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. Attempt any five questions:
(a) Describe the FORTRAN statement IMPLICIT NONE.
(b) Draw the flowchart symbols for input, decision, process and connector.
(c) Write at least 2 standard data types in fortan.
(d) Why is it necessary to declare return type of a user defined function in fortran?
(e) Write Latex statement to generate table of contents in Latex document.
(f) Give Latex to write any two Greek letters within a text line.
(g) Write gnuplot statements to put labels on the X and Y axis.
(h) Explain how gnuplot input file used for plotting.
2. Attempt any four questions:
(a) Draw a flow chart to read all elements of an array of real numbers of size.
(b) Write a program in fortran to read all elements of an array of real numbers of dimension $5 \times 5$ and find the average of all these elements.
(c) Explain the syntax of "go to" statement in fortran and describe its merit and drawbacks.
(d) Write the syntax of two Nested Block II statement in Fortran. Give example.
(e) Describe the advantages and disadvantages of Latex.
(f) Describe how to include graphics image files in Latex document.
3. Attempt any one questions:
(a) Describe any five features of Gnuplot. Describe the use of multiplot statement in Gnuplot with examples.
$5+5=10$
(b) Explain how gnuplot input file is created? Write the gnuplot statements involved in plotting $f(x)=\sin (5 x) / \sin (x)$ in the range $-2<x<2$ and saving the plot as ".eps" file. $5+5=10$

## B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS

Course ID : 32421
Course Title: Mathematical Physics II 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.

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

## Group-A

1. (a) Write a program to find whether the given number is odd or even.
(b) Write a program to display number from 1 to 20.
(c) Write a program to cheek whether the 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) Write a program to display the calendar day of December, 2019.

## Group-B

2. (a) Write a program to find area of a circle.
(b) Write a program to find the volume of a sphere.
(c) Write a program to determine the 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 cylindar with radius and height as input.
(g) (i) Make a list of the following number $4,8,26,82,100,202$
(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 find the area of triangle.
3. (a) Write a program to find the root of the equation $x^{3}-2 x-5=0$ using bisection method.
(b) Write a program to find a root of the polynomial $f(x)=x^{2}-63$ by Newton-Rapson method.
(c) Write a program to find a root of the equation $x^{3}-5 x+1=0$ using second method.
(d) Write a program to find a root of the equation $x^{3}-2 x-8=0$ by employing Newton-Rapson method.

# B.Sc. 3rd Semester (Honours) Practical Examination, 2019-20 PHYSICS 

Course ID : 32421
Course Code : SH/PHS/301/C-5/P-5
Course Title: Mathematical Physical II Lab
Time: 2 Hours
Full Marks: 15

## Instruction to the Examiners

The Laboratory Notebook must be submitted by the candidates before taking the answer script and question. Candidates have to draw a one question from each group and have to write the programme in the answer script. After completion of writing the programs, 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 are 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, but in case of not running the program, examiners are requested to give credit of maximum 1 mark for group A, 2 marks for group B \& 2 marks for group C questions for writing the program in answer script considering the matter. No marks should be given to LNB which has not been signed.

