SP-II/PHS/201/C-1B/T-2/18

B.Sc. Semester-II (Programme) Examination, 2018

PHYSICS

Subject Code : 22404 **Course Code : SP/PHS/201/C-1B/T-2**

Course Title : 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.

1. Answer *any five* questions: 1×5=5

যে-কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ

(a) What do you understand by magnetic moment? What is its unit?
চৌম্বক ভ্রামক বলতে কী বোঝো? এর একক কী?

(b) How could a ferromagnetic material be converted to a paramagnetic material?
একটি অয়শ্চৌম্বক পদার্থকে কীভাবে পরাচৌম্বক পদার্থে পরিণত করা যায়?

(c) State Ampere's circuital theorem.
অ্যাম্পিয়ারের পরিক্রমণন উপপাদ্যটি বিবৃত করো।

(d) Write down the expression of Poynting vector.
পয়েন্টিং ভেক্টরের গাণিতিক রূপটি লেখো।

(e) According to kinetic theory what is the average kinetic energy of each gas molecule? Is it a constant?
গতীয় তত্ত্ব অনুযায়ী প্রতিটি গ্যাস অণুর গড় গতিশক্তি কত? এটা কি ধ্রুবরাশি?

(f) State Wien's displacement law.
ভীনের সরণ সূত্রটি বিবৃত করো।

(g) State Zeroth law of thermodynamics.
তাপগতিতত্ত্বের আদি সূত্র বিবৃত করো।

(h) Which distribution law is obeyed by the following:
নিম্নলিখিত কণাগুলি কোন বণ্টন সূত্র মেনে চলে?

(i) Neutron
নিউট্রন

(ii) Ideal gas molecule
আদর্শ গ্যাসের অণু

2. Answer *any two* questions: 5×2=10

যে-কোনো দুটি প্রশ্নের উত্তর দাও ঃ

(a) (i) What is meant by average velocity and r.m.s. velocity of gas molecule?

অণুর গড় বেগ ও r.m.s. বেগ কাকে বলে?

(ii) Do these two have same value? Explain.

এ দুটি কি সমমানের? ব্যাখ্যা করো।

(iii) How atomicity of a gas molecule is determined from the ratio of two specific heats? 1+2+2=5

গ্যাসের দুই আপেক্ষিক তাপের অনুপাত থেকে ওই গ্যাস অণুর পারমাণবিকতা কীভাবে নির্ণয় করা যায়?

(b) (i) Write down the Curie law. Is it applicable to all types of matter?

কুরি সূত্রটি লেখো। এই সূত্রটি কি সকল প্রকার পদার্থের ক্ষেত্রে প্রযোজ্য?

(ii) A magnetic field of intensity 50 emu induces a magnetic field of 2500 emu in an iron rod of cross-sectional area 0·25 cm^2. Determine the magnetic permeability and intensity of magnetisation of the rod. (1+1+3)=5

50 emu প্রাবল্যের একটি চৌম্বকক্ষেত্র 0·25 cm^2 প্রস্থচ্ছেদের একটি দীর্ঘ লৌহদণ্ডের ভিতর 2500 emu চৌম্বক প্রবাহ সৃষ্টি করল। দণ্ডের চৌম্বক ভেদ্যতা এবং চুম্বকনের পরিমাত্রা নির্ণয় করো।

(c) (i) State the Stefan Boltzman law of blackbody radiation.

কৃষ্ণবস্তুর বিকিরণ সম্পর্কিত স্টিফান-বোলজম্যান সূত্রটি বিবৃত করো।

(ii) An electric heater radiates 1000W heat. Planar area of the heating coil is 0·02 m^2. Assuming the heating coil as a blackbody, determine the temperature of the coil.
Given, $\sigma = 6\times10^{-8}$ w/m^2K^4. 1½+3½=5

একটি বৈদ্যুতিক হিটার 1000W তাপ বিকিরণ করে। তাপকুণ্ডলীর তলক্ষেত্রের মান 0·02 m^2। কুণ্ডলী কৃষ্ণবস্তুর ন্যায় তাপ বিকিরণ করে ধরে নিয়ে, কুণ্ডলীর তাপমাত্রা নির্ণয় করো।
দেওয়া আছে, $\sigma = 6\times10^{-8}$ w/m^2K^4

(d) Establish the continuity equation. What is displacement current? 4+1=5

ধারাবাহিকতার সমীকরণটি প্রতিষ্ঠা করো। ভ্রংশ প্রবাহ কাকে বলে?

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3. Answer *any one* question: 10×1=10

যে-কোনো একটি প্রশ্নের উত্তর দাও ঃ

(a) (i) Write down the Bio-Savart law.

বায়ো-সাভার্ট-এর সূত্রটি লেখো।

(ii) Applying Bio-Savart law deduce the magnetic field intensity at any point due to current through a straight conducting wire. What will be the expression if the wire is infinitely long?

বায়ো-সাভার্ট সূত্র প্রয়োগ করে ঋজু প্রবাহের দরুন যেকোনো বিন্দুতে চৌম্বকক্ষেত্রের প্রাবল্য নির্ণয় করো। তার সুদীর্ঘ হলে চৌম্বকক্ষেত্রের প্রাবল্যের রাশিমালাটি কীরূপ হবে?

(iii) 15A current is flowing through a straight long wire. The wire is kept in Earth's magnetic field ($H = 0{\cdot}36 \times 10^{-4}T$). At which distance from the wire, the null deflection will be obtained? 1½+5+1+2½=10

একটি দীর্ঘ খাড়া তারে 15A প্রবাহ যাচ্ছে। তারটিকে ভূ-চৌম্বকক্ষেত্রে রাখা আছে ($H = 0{\cdot}36 \times 10^{-4}T$)। তার থেকে কতদূরে উদাসীন বিন্দু পাওয়া যাবে?

(b) (i) Establish the relation between two specific heats of a gas.

গ্যাসের দুটি মোলার আপেক্ষিক তাপের মধ্যে সম্পর্ক স্থাপন করো।

(ii) Which graph has greater gradient isothermal or adiabatic? Why?

সমোষ্ণ লেখ অপেক্ষা রুদ্ধতাপ লেখর নতি বেশি না কম? কেন?

(iii) Temperature of heat reservoir of a Carnot Engine is 7°C and its efficienty is 40%. How much the temperature of the heat reservoir should be increased to increase the efficienty of the engine to 50%? 4+(1+2)+3=10

একটি কার্নো ইঞ্জিনের তাপ-আধারের উষ্ণতা 7°C এবং কর্মদক্ষতা 40%। ইঞ্জিনের কর্মদক্ষতা বৃদ্ধি করে 50% করতে ইঞ্জিনের তাপ-আধারের উষ্ণতা কত বৃদ্ধি করতে হবে?

SH-II/PHS/201/C-3/P-3/PR/18

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

PHYSICS

Subject Code : 22411 **Course Code : SHPHS/201/C-3/P-3**

Course Title : Electricity and Magnetism Lab

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

The figures in the right hand side margin indicate marks.

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

1. Construct a one ohm coil. [Take at least three sets of readings for measuring both the resistance per unit length of the bridge wire and resistance of the sample wire]

(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) Resistance per unit length of the bridge wire 2½

(e) Resistance of the sample wire 2½

(f) Electrical midpoint of the bridge wire 1

(g) Comparison of the prepared ohm with the standard one ohm 2

(h) Calculation 1

(i) Accuracy 1

2. Measure the boiling point of a liquid using platinum resistance thermometer. [Null points for at least three different resistance in the third arm of P.O. box in each case should be shown]

(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 midpoint of the bridge wire 1

(e) Thermometer in ice 2

(f) Thermometer in steam 2

(g) Thermometer in boiling water 2

(h) Recording of barometer reading 1

(i) Calculation 1

(j) Accuracy 1

3. Determine E.C.E. of copper by measuring current with the help of a potentiometer. [Take readings for two different currents through the ammeter]

(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) Determination of maximum allowable current through voltameter 1

(e) Measurement of current 2×2=4

(f) Weighing of the cathode plate 1½+1½=3

(g) Calculation 1

(h) Accuracy 1

4. Determine the self inductance of the given coil by Anderson's bridge. [Take readings for at least two capacitors during A. C. balance]

(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) Readings for D.C. balance 2

(e) Readings for A.C. balance for two capacitors 3×3=6

(f) Calculation 1

(g) Accuracy 1

5. Determine the constant of the ballistic galvanometer by charging and discharging method. [Take readings for at least three different charging voltages]

(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) Recording of data for the determination of galvanometer constant 2+2+2=6

(e) V-d curve 2

(f) Calculation 1

(g) Accuracy 1

6. Draw resonance curve for a series L-C-R circuit for one value of resistance R keeping L and C fixed. Determine the Q-factor of the circuit from the graph. [Compare this value of Q-factor with the value obtained theoretically]

(a) Definition of the quantities to be measured. 2

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

(c) Circuit diagram with labelling 1

Recording of Data

(d) Recordings for drawing resonance curve 3
(e) Plotting of graph 2
(f) Determination of Q-value from graph 1
(g) Determination of Q-value theoretically 1
(h) Comparison of the Q-values 1
(i) Calculation 1

7. Draw the response curve of a parallel L-C-R circuit and determine its antiresonant frequency and quality factor Q.

(a) Definition of the quantities to be determined. 2
(b) Theory (working formula with explanation of symbols) 1
(c) Circuit diagram with labelling 1

Recording of Data

(d) Recordings for drawing response curve 3
(e) Plotting of graph 2
(f) Determination of antiresonant frequency 1
(g) Determination of quality factor Q 1
(h) Calculation 1
(i) Accuracy 1

8. Verify Thevenin's theorem and maximum power transfer theorem using the bridge network

(a) Definition of Thevenin's theorem and maximum power transfer theorem 2
(b) Theory (working formula with explanation of symbols) 1
(c) Circuit diagram with labelling 1

Recording of Data

(d) Recording of data for I_L-V_L graph 3
(e) Plotting of (I_L-V_L) graph and P-R_L graph 2+2=4
(f) Calculation 1
(g) Accuracy 1

9. Verify Norton's theorem and Maximum power transfer theorem using the bridge network.

(a) Definition of Norton's theorem and maximum power transfer theorem 2
(b) Theory (working formula with explanation of symbols) 1
(c) Circuit diagram with labelling 1

Recording of Data

(d) Recording of Data for V_L-I_L graph 3
(e) Plotting of (V_L-I_L) graph and P-R_L graph 2+2=4
(f) Calculation 1
(g) Accuracy 1

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

PHYSICS

Subject Code : 22411 **Course Code : SHPHS/201/C-3/P-3**

Course Title : Electricity and Magnetism Lab

(*General Instruction to Examiners*)

1. **Setting up of Experiments:**
   Examiners are requested to paste the question on a card. Cards may be duplicated. Programme schedule should be so arranged that at least 16 candidates may appear at each half of a day. A list of experiment set signed by both 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 candidate should draw a card for his experiment and in case of his inability to perform the experiment he may be given a second chance only after the drawing of all cards over. Candidates are required to write down their question on the first page of their answer sheet and return the cards to the examiners.

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

4. **Supervision of Theory/Data:**
   The candidates will first write down the theory and necessary diagrams (if required) in presence of the examiners and get them signed by any one of the examiners. Examiners are requested to check at least one data and sign there of, also required to keep a personal note of any fault committed by the candidates, which should be considered while awarding marks. They are also required to give special credit to candidate depending on his overall performance.

5. **Evaluation of answer scripts:**
   Both the two examiners should jointly check answer scripts and put their signatures. Please note that marks for each item such as theory, recordings of data, calculation, accuracy etc., should be shown clearly at the back side of the cover page of answer script. The systematic recording of data in tabular form with proper column heads, with proper units in the header of each column should be the main criterion for awarding marks. Calculators may be allowed but only after the completion of the recordings of data. The actual value of the quantity to be measured and the value obtained through the experiment should be shown side by side at the last page of the answer script. While awarding marks in the experiments related with graphs examiners are requested to see whether the maximum area of the graph has been used, display of units and axes levels are properly done or not.

6. **Distribution of Marks:**
   Total marks 15 should have the following divisions:
   (a) Experiment –13
   (b) Laboratory Notebook (LNB) – 02

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SH-II/PHS/202/C-4/P-4/PR/18

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

PHYSICS

Subject Code : 22412 **Course Code : PHS/202/C-4/P-4**

Course Title : Waves and Optics 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. Study normal modes of oscillation of two coupled pendulums and measure the normal mode frequencies.
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols) 1

(b) Systematic recording of data:

(i) Time for 20 oscillation to measure natural frequency. (Take reading at least three times) 2

(ii) Time for 20 oscillation for in phase mode. 4

(iii) Time for 20 oscillation for out of phase mode. 4

(c) Calculation 1

(d) Accuracy 1

2. Study two Lissajous figures for different phases and determine phase difference of two superposed waves with the help of Lissajous figures.
Distribution of marks:

(a) Theory (Working formulae with explanation of symbol) 1

(b) Systematic recording of data.

(i) Data recording for horizontal and vertical axis. [2½+2½]×2=10

(c) Calculation 1

(d) Accuracy 1

3. Adjust the spectrometer for parallel rays by Schuster's method and determine the angle of given prism.
Distribution of marks:

(a) Theory (Working formula with explanation of symbol) 1

(b) Levelling and focussing for parallel rays. 1+2=3

(c) Systematic recording of data:

(i) Vernier constant of the spectrometer. 1

(ii) Reading of the telescope for two position. 3+3=6

(d) Calculation 1

(e) Accuracy 1

4. Determine refractive index of the material of a prism using sodium source.
Distribution of marks:

(a) Theory (Working formulae with explanation of symbol)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data.	
(i) Vernier constant of the spectrometer	1
(ii) Data for the angle of prism	4
(iii) Telescope at minimum deviation	2
(iv) Direct reading of the telescope	2
(d) Calculation	1
(e) Accuracy	1

5. Determine the dispersive power of the material of a prism using mercury source. [Angle of prism supplied]
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	
(i) Vernier constant of the spectrometer	1
(ii) Reading of the telescope at minimum deviation	6
(iii) Direct reading of the telescope	2
(d) Calculation	1
(e) Accuracy	1

6. Determine Cauchy constant of the material of a prism using mercury source. [Angle of prism supplied]
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	
(i) Vernier constant of the spectrometer	1
(ii) Reading of the telescope at minimum deviation	5
(iii) Direct reading of the telescope	1
(d) Graph	2
(e) Calculation	1
(f) Accuracy	1

7. Determine wavelength of sodium light using Fresnel Biprism.
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Systematic recording of data	
(i) Determination of least count, vernier constant and adjustment of apparatus	½+½+1=2
(ii) Data for separation between virtual source	3
(iii) Data for fringe width	5
(c) Calculation	1
(d) Accuracy	1

8. Determine wavelength of Na source using plane diffraction grating. [No. of rulings of grating supplied]
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	
(i) Vernier constant of the spectrometer	1
(ii) Setting of the unrulled surface of the grating for normal incidence	4
(iii) Data for angle of diffraction for at least 2 orders	4
(d) Calculation	1
(e) Accuracy	1

9. Determine wavelength of Green colour lines of Hg source using plane diffraction grating. [Number of rulings of the grating supplied]
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	
(i) Vernier constant of spectrometer	1
(ii) Setting of the unrulled surface of the grating for normal incidence	4
(iii) Data for angle of diffraction for at least 2 orders	4
(d) Calculation	1
(e) Accuracy	1

10. Determine dispersive power of a plane diffraction grating. Number of rulings of the grating supplied.
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	
(i) Vernier constant of the spectrometer	1
(ii) Setting of the unrulled surface of the grating for normal incidence	4
(iii) Data for angle of diffraction	4
(d) Calculation	1
(e) Accuracy	1

11. Determine resolving power of a plane diffraction grating
Distribution of marks:

(a) Theory (Working formulae with explanation of symbols)	1
(b) Adjustment of the spectrometer	1
(c) Systematic recording of data	9
(d) Calculation	1
(e) Accuracy	1

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

PHYSICS

Subject Code : 22412 **Course Code : PHS/202/C-4/P-4**

Course Title : Waves and Optics 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. Marks for accuracy are to be awarded on the basis of the correct result, calculated by the examiners.

Special instructions for different experiments:

Experiment No. 3 : Examiners are requested to award marks for levelling and focussing for parallel rays on the basis of proper adjustment of the Spectrometer.

Experiment No. 5 : Supplied data — angle of prism.

Experiment No. 6 : Supplied data — angle of prism.

Experiment No. 8 : Supplied data — number of rulings of the grating.

Experiment No. 9 : Supplied data — number of rulings of the grating.

Experiment No. 10 : Supplied data — number of rulings of the grating.

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SH-II/PHS/203/GE-2/P-2(PR)/18

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

PHYSICS

Subject Code : 22413 **Course Code : SH/PHS/203/GE-2/P-2**

Course Title : Electromagnetism and Thermal Physics Lab

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

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

1. Measure the Planck's Constant using black-body radiation.
(কৃষ্ণবস্তু বিকিরণ প্রণালীতে প্লাঙ্কের ধ্রুবক নির্ণয় করো।)

Marks distribution:

Definition & working formula with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2	7+2 (graph) = 9	1	1

2. Determine the Stefan's constant.
(স্টীফানের ধ্রুবক নির্ণয় করো।)

Marks distribution:

Definition & working formula with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2	6+3 (graph) = 9	1	1

3. Determine the thermal conductivity of a bad conductor by Le and Charlton's Disc Method.
(লি ও চার্লটন ডিস্ক পদ্ধতিতে কোনো কুপরিবাহী পদার্থের তাপ পরিবাহিতাঙ্ক নির্ণয় করো।)

Marks distribution:

Definition of the quantity to be measured	Working principles with the symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
1	1	7+2 (graph) = 9	1	1

4. Using Multimeter measure the followings:
(মাল্টিমিটারের সাহায্যে নিম্নলিখিতগুলি পরিমাপ করোঃ)

(a) Three given resistances

(b) DC current in the circuit

Marks distribution:

Theory of the experiment	Systematic recording of data & performance	Accuracy
2	9	2

5. Using Multimeter measure the followings:
(মাল্টিমিটারের সাহায্যে নিম্নলিখিতগুলি পরিমাপ করোঃ)

(a) AC and DC voltages

(b) Checking electrical fuses in the circuit

Marks distribution:

Theory of the experiment	Systematic recording of data & performance	Accuracy
2	9	2

6. Measurement of CDR of a Ballistic Galvanometer. Take one set of turn of secondary coil for at least one current.
(ক্ষেপক গ্যালভানোমিটারের CDR পরিমাপ করো।)

Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
1	1+1 = 2	6+2 (graph) = 8	1	1

7. Determine a high resistance by Leakage method with the help of Ballistic Galvanometer.
(ক্ষেপক গ্যালভানোমিটারের সাহায্যে Leakage পদ্ধতিতে উচ্চমানের রোধ নির্ণয় করো।)

Marks distribution:

Theory & circuit diagram with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2+1 = 3	6+2 (graph) = 8	1	1

8. Draw the characteristics (current vs. frequency curve) of series RC circuit (Take at least two input voltages)
(শ্রেণি সমবায়ে যুক্ত RC বর্তনীর বৈশিষ্ট্যমূলক লেখচিত্র অঙ্কন করো।)

Marks distribution:

Theory & circuit diagram with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Precaution & Discussion
2+1 = 3	6+2 (graph) = 8	1	1

9. Study the response curve of a series LCR circuit and determine its
(একটি শ্রেণি LCR বর্তনীর Response curve অঙ্কন করো এবং অনুনাদ কম্পাঙ্ক ও Q-গুণক নির্ণয় করো।)

(a) resonant frequency

(b) quality factor (use one combination of L, C, & R)

Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
2	1+1 = 2	5+2 (graph) = 7	1	1

10. Determine an unknown low resistance using Carey-Foster's Bridge.
(ক্যারি ফস্টার ব্রিজের সাহায্যে অজ্ঞাত নিম্নমানের রোধ নির্ণয় করো।)
Marks distribution:

Working formula with circuit diagram, symbols sufficiently explained	Recording of data & performance	Calculation	Accuracy
2+1 = 3	8	1	1

11. Verify the Thevenin's theorem by using minimum Five load resistances.
(কমপক্ষে পাঁচটি ভাররোধের সাহায্যে Thevenin তত্ত্বের সত্যতা প্রমাণ করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

12. Verify the Norton's theorem by using minimum Five load resistances.
(কমপক্ষে পাঁচটি ভাররোধের সাহায্যে Norton তত্ত্বের সত্যতা প্রমাণ করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

13. Verify the Maximum Power Transfer theorem.
(সর্বোচ্চ ক্ষমতা হস্তান্তরের তত্ত্বটি যাচাই করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

14. Determine the resistance of suspended coil Galvanometer by half deflection method and hence find the current sensitivity of the Galvanometer.
(অর্ধবিক্ষেপ পদ্ধতিতে প্রলম্বিত কুণ্ডলী গ্যালভানোমিটারের রোধ নির্ণয় করো এবং গ্যালভানোমিটারের প্রবাহ সুবেদীতা নির্ণয় করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2	6+2 (circuit) = 8	1	1

15. Determine the potential difference across a low resistance & hence find the current through it with the help of potentiometer.
(পোটেনশিওমিটারের সাহায্যে নিম্নমানের রোধে বিভব পতন ও তার মধ্যে দিয়ে প্রবাহ নির্ণয় করো।)
Marks distribution:

Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
2+1 = 3	8	1	1

16. Determine the coefficient of Linear Expansion of the material of a rod using optical lever method.
(Optical Lever পদ্ধতিতে কোন পরিবাহী দণ্ডের দৈর্ঘ্য প্রসারণ গুণাঙ্ক নির্ণয় করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	1+1 = 2	8	1	1

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

PHYSICS

Subject Code : 22413 **Course Code : SH/PHS/203/GE-2/P-2**

Course Title : Electromagnetism and Thermal Physics Lab

MARKS DISTRIBUTION

Full Marks	15	Laboratory Notebook	02
		Experiment	13

Instruction to Examiners

1. 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 Internal and External examiners along with answer script packet should be sent to The University. In no case, Examination will be conducted by the Internal Examiner alone. Secrecy of the result must be maintained.
2. 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 the card. No credit should be given to Notebook which has not been signed.
3. Candidates are required to write down the full question as provided with all details (Sl. No., Instructions etc.) on answer script and return the card to the examiner. Candidates will first write down the theory (only for working formula explaining the symbols used) in presence of examiners. It should be checked and signed by either of the examiners before the commencement of the data recording procedure by each examinee.
4. Examiners are requested to observe the systematic working of the candidate according to the instruction and sign some 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 as specified in the question paper (definition, working formula, circuit diagram, data recording, graph, calculation and accuracy of result etc.) must be shown separately on the back side of the first cover page of the answer script.
5. 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, circuit designing 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 and accurate result.

6. The following data for different experiments should be supplied to the candidates:

(i) Q. No. 2 — Draper point (when the filament just shows a dull red glow). Data for drawing calibration curve

(ii) Q. No. 3 — Steady Temperatures, Mass, Radius, Thickness and Specific heat of the material of the Disc.

(iii) Q. No. 7 — Time constant should be less (approximately 15-20 sec.). Candidates will do the Experiment for One (01) value of capacitor and no need to take the natural leakage reading.

(iv) Q. No. 10 — Specific resistance of the bridge.

(v) Q. No. 15 — Specific resistance of the bridge.

7. All the Answer scripts should be kept preserved for one year from the *completion of the examination.*

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SH-II/PHS/201/C-3/T-3/18

B.Sc. Semester-II (Honours) Examination, 2018

PHYSICS

Subject Code : 22401 **Course Code : PHS/201/C-3/T-3**

Course Title : Electricity and Magnetism

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. Answer *any five* questions: 1×5=5

(a) Will there be any loss of energy when two charged conductors of same potential are connected together?

(b) What will happen to a soap bubble if it is charged?

(c) What is the advantage of Thevenin's theorem over Kirchhoff's law?

(d) The magnetic field in a certain region is given by $\vec{B} = (40\hat{\imath} - 18\hat{k})T$. How much flux passes through a 5 cm^2 area loop in this region if the loop lies flat on the *xy* plane.

(e) Define displacement current.

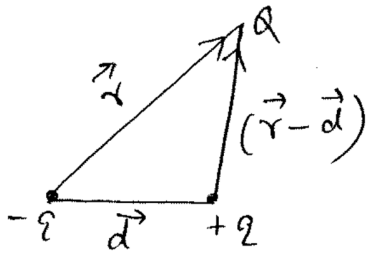
(f) What do you mean by the energy density of a magnetic field?

(g) Write down the differential form of Faraday's law.

(h) State Ampere's circuital law.

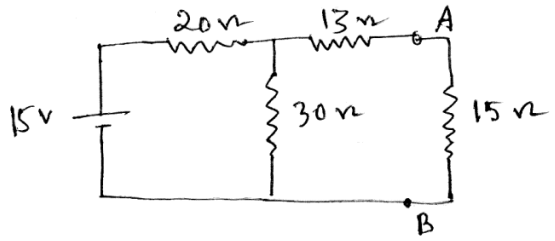
2. Answer *any two* questions. 5×2=10

(a)



Find the potential and electric field at point *Q* as shown in figure due to an electric dipole of dipole moment $\vec{P} = q\vec{d}$. Here *q* is the charge and *d* is the small distance between the two charges. 2+3=5

(b)



Find the Thevenin's equivalent circuit of the above circuit to the left of terminals A and B. Calculate the current and voltage across 15Ω load resistance. 3+1+1=5

(c) By using Biot-Savart law, show that magnetic induction vector has divergence less character. From this nature, comment about magnetic pole? 3+2=5

(d) (i) Illustrate the nature of the hysteris is loop of a sample of steel and that of a soft iron piece. Indicate, from these how the two materials differ in their magnetic behaviours.

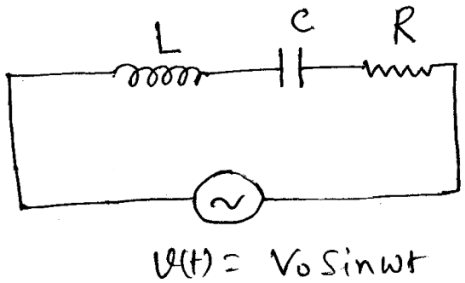
(ii) Prove that when a sample of magnetic material is subjected to a periodic magnetic field, an amount of energy proportional to the area of the hysteresis loop is lost per cycle. (1+1)+3=5

3. Answer *any one* question. 10×1=10

(a) (i) What is the basic principle to produce AC voltage?

(ii) Explain the term 'lead' and 'lag' related to instantaneous current and voltage in AC circuit.

(iii)



A series LCR circuit shown in figure is driven by an alternating voltage source $v(t) = v_0 Sinwt$, where w is variable angular frequency.

(A) Find instantaneous current.

(B) Show graphically instantaneous current and voltage.

(C) If $L = 10\ mH$, $C = 25\mu F$ and $R = 25\Omega$, find resonance frequency and quality factor.

2+(1+1)+{3+1+(1+1)}=10

(b) (i) Find the magnetic vector potential $\vec{A}$ at a distance r from a straight current carrying wire of length $2L$.

(ii) Derive an expression of the torque on a current loop placed in a uniform magnetic field $\vec{B}$.

5+5=10

SH-II/PHS/202/C-4/T-4/18

B.Sc. Semester-II (Honours) Examination, 2018

PHYSICS

Subject Code : 22402 **Course Code : PHS/202/C-4/T-4**

Course Title : Waves and Optics

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. Answer *any five* questions: 1×5=5

(a) A damped oscillation is described as $\frac{d^2x}{dt^2} + 8\frac{dx}{dt} + 8x = 0$. Comment on the type of the damped motion whether it is overdamped or underdamped or critically damped.

(b) Find the intensity level of a sound wave having intensity 2×10^{-4} watt/m^2.

(c) What do you mean by 'Haidinger Fringes'?

(d) How many orders would be visible if $\lambda = 589$ nm for the incident light and the number of lines in the grating is 104 per nm?

(e) Construct the Lissajous figure for the following equation when $\delta = \pi/2$

$x = a\cos(2\omega t + \delta)$ and $y = b\cos\omega t$.

(f) What do you mean by temporal and spatial coherence?

(g) What are the causes due to which a particle executes simple harmonic motion?

(h) How holography differ from ordinary photography?

2. Answer *any two* questions: 5×2=10

(a) What is beat frequency? What do you understand by 'logarithmic decrement', 'relaxation time' and 'quality factor' of weekly damped harmonic oscillator? What is the relation between them? 1+3+1=5

(b) Considering the expression for instantaneous position of particle during forced oscillation, find the expression of power supplied by the driving force averaged over a cycle.
Hence show that in a steady state forced vibration the rate of dissipation of energy due to damping force is equal to the rate of supply of energy by the driving force in each cycle. 2+3=5

(c) Find the phase velocity for propagation of one dimensional progressive wave through fluid medium. If the length of the string is 0·5m and mass per unit length is 0·01 Kgm^{-1}, then find the tension produced in the string for a frequency of 250 Hz (fundamental). 3+2=5

(d) What is resolving power? Write the Rayleigh criterion of resolution. Deduce an expression for resolving power of grating. 1+1+3=5

3. Answer *any one* question: 10×1=10

(a) What do you mean by Coherent light? Discuss the conditions for interference. How would you determine the wavelength of light with the Lloyd's mirror experiment? Why is the central fringe dark in Lloyd's mirror? What are the main differences between interference and diffraction?

1+1+4+1+3=10

(b) Obtain the intensity formulation for Fraunhofer's double slit diffraction. What are the missing order for $b = 2a$. Draw the corresponding intensity profile. What is the basic principle of Holography?

(5+1+1)+3=10

SP-II/PHS/201/Prog.(PR)/18

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

PHYSICS

Subject Code : 22414 **Course Code : SP/PHS/201/Prog.**

Course Title : Electromagnetism and Thermal Physics (lab)

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

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

1. Measure the Planck's Constant using black-body radiation.
(কৃষ্ণবস্তু বিকিরণ প্রণালীতে প্লাঙ্কের ধ্রুবক নির্ণয় করো।)

Marks distribution:

Definition & working formula with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2	7+2 (graph) = 9	1	1

2. Determine the Stefan's constant.
(স্টীফানের ধ্রুবক নির্ণয় করো।)

Marks distribution:

Definition & working formula with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2	6+3 (graph) = 9	1	1

3. Determine the thermal conductivity of a bad conductor by Le and Charlton's Disc Method.
(লি ও চার্লটন ডিস্ক পদ্ধতিতে কোনো কুপরিবাহী পদার্থের তাপ পরিবাহিতাঙ্ক নির্ণয় করো।)

Marks distribution:

Definition of the quantity to be measured	Working principles with the symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
1	1	7+2 (graph) = 9	1	1

4. Using Multimeter measure the followings:
(মাল্টিমিটারের সাহায্যে নিম্নলিখিতগুলি পরিমাপ করোঃ)

(a) Three given resistances

(b) DC current in the circuit

Marks distribution:

Theory of the experiment	Systematic recording of data & performance	Accuracy
2	9	2

5. Using Multimeter measure the followings:
(মাল্টিমিটারের সাহায্যে নিম্নলিখিতগুলি পরিমাপ করোঃ)

(a) AC and DC voltages

(b) Checking electrical fuses in the circuit

Marks distribution:

Theory of the experiment	Systematic recording of data & performance	Accuracy
2	9	2

6. Measurement of CDR of a Ballistic Galvanometer. Take one set of turn of secondary coil for at least one current.
(ক্ষেপক গ্যালভানোমিটারের CDR পরিমাপ করো।)

Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
1	1+1 = 2	6+2 (graph) = 8	1	1

7. Determine a high resistance by Leakage method with the help of Ballistic Galvanometer.
(ক্ষেপক গ্যালভানোমিটারের সাহায্যে Leakage পদ্ধতিতে উচ্চমানের রোধ নির্ণয় করো।)

Marks distribution:

Theory & circuit diagram with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Accuracy
2+1 = 3	6+2 (graph) = 8	1	1

8. Draw the characteristics (current vs. frequency curve) of series RC circuit (Take at least two input voltages)
(শ্রেণি সমবায়ে যুক্ত RC বর্তনীর বৈশিষ্ট্যমূলক লেখচিত্র অঙ্কন করো।)

Marks distribution:

Theory & circuit diagram with symbols sufficiently explained	Systematic recording of data & performance	Calculation	Precaution & Discussion
2+1 = 3	6+2 (graph) = 8	1	1

9. Study the response curve of a series LCR circuit and determine its
(একটি শ্রেণি LCR বর্তনীর Response curve অঙ্কন করো এবং অনুনাদ কম্পাঙ্ক ও Q-গুণক নির্ণয় করো।)

(a) resonant frequency

(b) quality factor (use one combination of L, C, & R)

Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
2	1+1 = 2	5+2 (graph) = 7	1	1

10. Determine an unknown low resistance using Carey-Foster's Bridge.
(ক্যারি ফস্টার ব্রিজের সাহায্যে অজ্ঞাত নিম্নমানের রোধ নির্ণয় করো।)
Marks distribution:

Working formula with circuit diagram, symbols sufficiently explained	Recording of data & performance	Calculation	Accuracy
2+1 = 3	8	1	1

11. Verify the Thevenin's theorem by using minimum Five load resistances.
(কমপক্ষে পাঁচটি ভাররোধের সাহায্যে Thevenin তত্ত্বের সত্যতা প্রমাণ করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

12. Verify the Norton's theorem by using minimum Five load resistances.
(কমপক্ষে পাঁচটি ভাররোধের সাহায্যে Norton তত্ত্বের সত্যতা প্রমাণ করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

13. Verify the Maximum Power Transfer theorem.
(সর্বোচ্চ ক্ষমতা হস্তান্তরের তত্ত্বটি যাচাই করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2+1 = 3	5+2 (graph) = 7	1	1

14. Determine the resistance of suspended coil Galvanometer by half deflection method and hence find the current sensitivity of the Galvanometer.
(অর্ধবিক্ষেপ পদ্ধতিতে প্রলম্বিত কুণ্ডলী গ্যালভানোমিটারের রোধ নির্ণয় করো এবং গ্যালভানোমিটারের প্রবাহ সুবেদীতা নির্ণয় করো।)
Marks distribution:

Definition of the quantity to be measured	Working formula with symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	2	6+2 (circuit) = 8	1	1

15. Determine the potential difference across a low resistance & hence find the current through it with the help of potentiometer.
(পোটেনশিওমিটারের সাহায্যে নিম্নমানের রোধে বিভব পতন ও তার মধ্যে দিয়ে প্রবাহ নির্ণয় করো।)

Marks distribution:

Working formula with circuit diagram, symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
2+1 = 3	8	1	1

16. Determine the coefficient of Linear Expansion of the material of a rod using a optical lever method.
(Optical Lever পদ্ধতিতে কোন পরিবাহী দণ্ডের দৈর্ঘ্য প্রসারণ গুণাঙ্ক নির্ণয় করো।)

Marks distribution:

Definition of the quantity to be measured	Working formula with symbols sufficiently explained	Data recording & performance	Calculation	Accuracy
1	1+1 = 2	8	1	1

B.Sc. Semester-II (Programme) Examination, 2018

PHYSICS PRACTICAL

Subject Code : 22414 **Course Code : SP/PHS/201/Prog.**

Course Title : Electromagnetism and Thermal Physics (lab)

MARKS DISTRIBUTION

Full Marks	15	Laboratory Note Book	02
		Experiment	13

Instruction to Examiners

1. 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 Internal and External examiners along with answer script packet should be sent to The University. In no case, Examination will be conducted by the Internal Examiner alone. Secrecy of the result must be maintained.

2. 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 the card. No credit should be given to Notebook which has not been signed.

3. Candidates are required to write down the full question as provided with all details (Sl. No., Instructions etc.) on answer script and return the card to the examiner. Candidates will first write down the theory (only for working formula explaining the symbols used) in presence of examiners. It should be checked and signed by either of the examiners before the commencement of the data recording procedure by each examinee.

4. Examiners are requested to observe the systematic working of the candidate according to the instruction and sign some 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 as specified in the question paper (definition, working formula, circuit diagram, data recording, graph, calculation and accuracy of result etc.) must be shown separately on the back side of the first cover page of the answer script.

5. 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, circuit designing 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 and accurate result.

6. The following data for different experiments should be supplied to the candidates:

(i) Q. No. 2 — Draper point (when the filament just shows a dull red glow). Data for drawing calibration curve

(ii) Q. No. 3 — Steady Temperatures, Mass, Radius, Thickness and Specific heat of the material of the Disc.

(iii) Q. No. 7 — Time constant should be less (approximately 15-20 sec.). Candidates will do the Experiment for One (01) value of capacitor and no need to take the natural leakage reading.

(iv) Q. No. 10 — Specific resistance of the bridge.

(v) Q. No. 15 — Specific resistance of the bridge.

7. All the Answer scripts should be kept preserved for one year from the *completion of the examination.*

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SH-II/PHS/GE-2/T-2/18

B.Sc. Semester-II (Honours) Examination, 2018

PHYSICS

Subject Code : 22403 **Course Code : SHPHS/203/GE-2/T-2**

Course Title : Electromagnetism and 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: 5×1=5

যে-কোনো পাঁচটি প্রশ্নের উত্তর দাও ঃ

(a) What do you mean by most probable velocity? Write down its expression.
সর্বাপেক্ষা সম্ভাব্য গতিবেগ কাকে বলে? এর মান কত?

(b) State Wein's displacement law. Why it is called displacement law?
ভীনের সরণ সূত্র বিবৃত করো। একে সরণ সূত্র বলে কেন?

(c) Define second law of thermodynamics on the basis of change of entropy.
এনট্রপি পরিবর্তনের সাপেক্ষে তাপ গতিবিদ্যার দ্বিতীয় সূত্র বিবৃত করো।

(d) Give the definition of magnetic permeability.
চৌম্বক ভেদ্যতার সংজ্ঞা দাও।

(e) How non-inductive coil is formed?
আবেশহীন কুন্ডলী কীভাবে তৈরি করা হয়?

(f) How does the self inductance of a long solenoid depend on its length and number of turns?
একটি সুদীর্ঘ সলিনয়েডের স্বাবেশাংক কীভাবে তার দৈর্ঘ্য এবং পাক সংখ্যার ওপর নির্ভর করে?

(g) Write in brief the meaning of Maxwell's equation $\vec{\nabla} \cdot \vec{B} = 0$.
ম্যাক্সওয়েলের সমীকরণ $\vec{\nabla} \cdot \vec{B} = 0$ সম্পর্কটির সংক্ষিপ্ত অর্থটি লেখো।

(h) Which distribution law is followed by the following particles?
নিম্নলিখিত কণাগুলি কোন বন্টন সূত্র মেনে চলে?

(i) Electron
ইলেকট্রন

(ii) Proton
প্রোটন

2. Answer *any two* questions: 5×2=10

যে-কোনো দুটি প্রশ্নের উত্তর দাও ঃ

(a) Write down Biot-Savart law. Find the magnetic field intensity at an axial point due to the current flowing through a circular coil. 1+4=5

বায়োট-সাভার্ট সূত্রটি বিবৃত করো। তড়িদ্বাহী বৃত্তাকার পরিবাহীর দরুন তার অক্ষস্থিত কোনো বিন্দুতে চৌম্বক প্রাবল্য নির্ণয় করো।

(b) Write down the comparison between M-B, B-E and F-D statistics. A certain black body with a surface area of 2×10^{-5} cm^2 has a constant temperature 1000 K. What is the total power rediated by the black body? 3+2=5

M-B, B-E এবং F-D পরিসংখ্যানের তুলনা করো। একটি 2×10^{-5} cm^2 ক্ষেত্রফল সম্পন্ন কৃষ্ণবস্তু 1000 K উষ্ণতায় মোট কত তাপশক্তি বিকিরণ করে তা নির্ণয় করো।

(c) Write down the differences between Joule - Thomson expansion and adiabatic expansion. Establish the relation between the specific heat of a gas at constant pressure and at constant volume. 2+3=5

জুল-থমসন প্রসারণ এবং রুদ্ধতাপ প্রসারণের পার্থক্য উল্লেখ করো। স্থির আয়তনে গ্যাসের আপেক্ষিক তাপ এবং স্থির চাপে ওই গ্যাসের আপেক্ষিক তাপের ভিতর সম্পর্ক স্থাপন করো।

(d) Explain the analogy between the inductive property of a current carrying coil and the inertial property of a material. Find out the mutual inductance between two co-axial current carrying solenoids. 2+3=5

তড়িৎ বর্তনীর স্বাবেশ ধর্ম এবং জড় বস্তুর জাড্য ধর্ম পরস্পরের সদৃশ — ব্যাখ্যা করো। দুটি সমাক্ষ তড়িদ্বাহী সলিনয়েডের পারস্পরিক আবেশ গুণাঙ্ক নির্ণয় করো।

3. Answer *any one* question: 10×1=10

যে-কোনো একটি প্রশ্নের উত্তর দাও ঃ

(a) Prove that the slope of an adiabatic curve drawn through a point on the *p-v* diagram of an ideal gas is γ-times the slope of isothermal curve-drawn through the same point.

Calculate the work done in the case of adiabatic expansion of a perfect gas. Taking an ideal gas as working substance describe, with the help of *p-v* diagrams the working of a Carnot engine. Find out an expression for its efficiency. 3+3+4=10

দেখাও যে *p-v* লেখচিত্রের কোনো বিন্দুতে অঙ্কিত রুদ্ধতাপ প্রক্রিয়ার নতি সামাষ্ঠ প্রক্রিয়ার নতির তুলনায় γ-গুণ বেশি। একটি আদর্শ গ্যাসের রুদ্ধতাপ প্রক্রিয়ায় কৃতকার্যের পরিমাণ নির্ণয় করো।

আদর্শ গ্যাসকে কার্যকর উপাদান হিসেবে ব্যবহার করে একটি কার্নো ইঞ্জিনের কার্যপ্রণালী *p-v* চিত্র সংযোগে বর্ণনা করো। এই ইঞ্জিনের দক্ষতার রাশিমালা নির্ণয় করো।

(b) State Ampere's circuital theorem and show that the theorem can be expressed as $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ in mathematical form. Find an expression of magnetic field intensity inside a current carrying solenoid using Ampere's circuital theorem. A wire shaped to a regular square of side $2a$ carries a current i ampere. Calculate the strength of the magnetic field B at the centre of the square.

1+3+4+2=10

অ্যাম্পিয়ারের বদ্ধপথ পরিক্রমণ তত্ত্বটি লেখো এবং দেখাও যে তত্ত্বটিকে $\vec{\nabla} \times \vec{B} = \mu_0 \vec{J}$ আকারে প্রকাশ করা যায়। অ্যাম্পিয়ারের বদ্ধপথ তত্ত্বের সাহায্যে কোনো তড়িদ্বাহী সলিনয়েডের অভ্যন্তরে চৌম্বকক্ষেত্র প্রাবল্যের মান নির্ণয় করো। $2a$ বাহুবিশিষ্ট্য একটি বর্গাকার পরিবাহীতে i তড়িৎ প্রবাহিত হচ্ছে। পরিবাহীটির কেন্দ্রে চৌম্বকক্ষেত্র প্রাবল্য B নির্ণয় করো।
