



K17P 0396

Reg. No. : BSPSPH1816

Name : Pranay A. K.

Fourth Semester M.Sc. Degree (Reg./Suppl./Imp.)

Examination, March 2017

(2014 Admission Onwards)

PHYSICS

PHY 4C14 : Optics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (Either **a** or **b**) :

1. a) Describe with energy level diagram the principle and working of a He-Ne laser. Give its applications.

OR

- b) i) Explain the nonlinearity in the polarization of the medium.
ii) Derive the equation for the generation of second harmonics.

- ✓ 2. a) i) Describe the characteristics of single mode and multimode optical fibres.
ii) Derive the expression for numerical aperture in optical fibres and give its significance.

OR

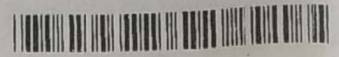
- b) Derive the Einstein coefficients in the theory of laser. Discuss material dispersion and waveguide dispersion in optical fibres. (2×12=24)

SECTION – B

Answer **any four**. (One mark for Part **a**, 3 marks for Part **b**, 5 marks for Part **c**) :

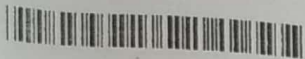
3. a) What do you mean by spatial coherence ?
b) Explain the rate equation for a three level laser system.
c) What are the different types of line broadening mechanisms in laser ?
- ✓ 4. a) What is electro-optic effect ?
b) Discuss the principles of intensity and phase modulation using electro-optic effect.
c) With the help of diagram, describe the sum frequency and difference frequency generation.

P.T.O.



5. a) Define axial modes in a cavity resonator.
b) The half width of the gain profile of a He-Ne laser material is 2×10^{-3} nm. If the length of the cavity is 30 cm, how many longitudinal modes can be excited? The emission wavelength of He-Ne laser is 6328 Å.
c) Explain the working of solid state ruby laser.
6. a) What are the different losses in optical fibre.
b) Calculate the numerical aperture if the value of mode parameter is 2.111 for a single mode fibre. Diameter of the core is $4.01 \mu\text{m}$ and the wavelength of laser light is $1.3 \mu\text{m}$.
c) Discuss signal degradation in optical fibres?
7. a) What is self-focussing of light?
b) Distinguish between Type 1 and Type 2 phase matching.
c) Write a note on Coherent Antistoke's Raman Scattering.
8. a) Give the characteristics of laser beam.
b) The length of a laser tube is 150 mm and the gain factor of the laser material is 0.0005/cm. If one of the cavity mirrors reflect 100% light that is incident on it, what is the required reflectance of the other cavity mirror?
c) Discuss power launching in optical fibres.

(4×9=36)



K17P 0397

Reg. No. : ...BSPSPH1816...

Name : ...Srinivas CK...

Fourth Semester M.Sc. Degree (Reg./Suppl./Imp.) Examination, March 2017
(2014 Admission Onwards)

PHYSICS

PHY4C15 : Numerical Technique and Probability

Time : 3 Hours

Max. Marks : 60

SECTION - A

Answer any two.

1. a) Give an account of Chi-square distribution. Explain the probability density function of Chi-square distribution. Mention the applications of the Chi-square distribution.

OR

- b) What do you understand by theoretical distributions ? Discuss the relation between Binomial, Poisson and Normal distributions. Why does the Normal distribution occupy the most honourable position in statistical analysis.

2. a) i) Explain Simpson's $\frac{3}{8}$ rule.

- ii) Briefly describe Regula Falsi method for finding the real root of an equation.

OR

- b) i) Derive Lagrange's Interpolation formula for unequal intervals.

- ii) Obtain the Euler's formula for the numerical solution of the differential equation.

(2×12=24 Marks)

SECTION - B

Answer any four.

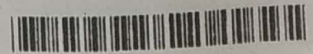
1 mark for Part - a, 3 mark for Part - b, 5 mark for Part - c.

3. a) What is the probability that a leap year selected at random will contain 53 Tuesdays ?

- b) State and prove Addition theorem of probability.

- c) Briefly explain Bayes' theorem.

P.T.O.



4. a) What is binomial distribution ?
b) What are the properties of Normal distribution.
c) Fit a Poisson distribution to the following data and calculate the theoretical frequencies.

x:	0	1	2	3	4
f:	123	59	14	3	1

5. a) When shall we not use Newton-Raphson method ?
b) Give an account of Iteration method for obtaining solutions for transcendental equations.
c) Find a real root of the equation $x^3 - 3x + 1 = 0$ lying between 1 and 2 correct to three places of decimal by using bisection method.
6. a) What is the order of convergence of the method of successive approximations ?
b) What are the conditions for the validity of Chi-square test ?
c) Find the first and second order differences for $f(x) = ab^{cx}$.

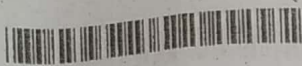
7. a) When will we use Newton's backward interpolation formula ?
b) Obtain Newton's forward interpolation formula for equal intervals.

- c) Use the Trapezoidal rule to estimate the integral $\int_0^2 e^{x^2} dx$ taking the number 10 intervals.

8. a) Write the Runge-Kutta fourth order formulae .
b) Explain the principle of least squares.

- c) Evaluate the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ using Simpson's $\frac{1}{3}$ rule.

(4×9=36)



K17P 0399

Reg. No. :

Name :

Fourth Semester M.Sc. Degree (Reg./Suppl./Imp.)

Examination, March 2017

PHYSICS (2014 Admission Onwards)

PHY4E07 : Astrophysics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (Either **a** or **b**).

1. a) Write a note on the celestial sphere. Discuss the celestial co-ordinate systems used to find the position of a heavenly object.

OR

- b) Discuss the energy generation in stars.

2. a) Distinguish between optical double stars and binary stars. Write a note on the classification of binary stars. Discuss visual binary stars with examples.

OR

- b) Give the general structure of a galaxy. Write a note on different types of galaxies. (2×12=24)

SECTION – B

Answer **any four**. (One mark for Part – **a**, 3 marks for Part – **b**, 5 marks for Part – **c**)

3. a) Define luminosity of a star.

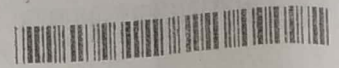
- b) Show that the brightness of two stars whose apparent magnitudes differ by unity will differ by a factor of 2.512 when ratio of brightness of stars of first and sixth magnitude is 100.

- c) Define bolometric correction, absolute magnitude and distance modulus.

4. a) Give the Harvard system of spectral classification.

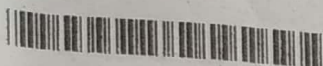
- b) What is H-R diagram ? Give its importance.

P.T.O.



K17P 0399

- c) What is Hertzsprung gap ? Draw a neat sketch of the HR diagram showing the position of :
- Cepheid variables
 - Red giants and subdwarfs
 - The white dwarfs.
5. a) Define Schwartzchild radius.
- b) Calculate the rotational energy of a neutron star of $1 M_{\text{sun}}$ and 10 km radius, having a period of 100 milliseconds. If the observed slow-down rate of this pulsar is 10^{-13} , calculate the rate of rotational-energy loss by this pulsar.
- c) Write a note on pulsars.
6. a) Name the theory which explain the aspects of origin of binary stars.
- b) Discuss the light curve of an eclipsing binary.
- c) A star has a luminosity equal to that of the sun. Its surface temperature is 2500 K. Compute the radius of the star in terms of the radius of the sun.
7. a) Where in the universe do we find strong radiation in X-rays ?
- b) Write a note on red shift of quasars.
- c) Describe the morphological classification for clusters of galaxies.
8. a) Distinguish between closed and open universe.
- b) What are bumbs seen in the early universe ?
- c) Show that at any given epoch the curvature of space is related to the energy content of the Universe as defined by its total density and pressure. (4×9=36)



K17P 0400

Reg. No. :

Name :

Fourth Semester M.Sc. Degree (Reg./Suppl./Imp.)

Examination, March 2017

PHYSICS

(2014 Admission Onwards)

PHY 4E08 : Electronic Instrumentation

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a** or **b**) :

1. a) Explain the basic characteristics of measuring devices.

OR

b) Explain the electrostatic deflection of a CRT beam and deduce the expression for deflection on the fluorescent screen in meters and deflection factor G of the CRT.

2. a) Explain with necessary figures the working of

a) Variable capacitor transducer

b) Hall effect angular displacement transducer.

OR

b) Explain with circuit diagram Wheatstone bridge for strain measurement in a strain gauge. Draw the Poisson configurations and obtain the expression for output voltage of

a) Half Bridge

b) Full Bridge

(2x12=24)

SECTION – B

Answer **any four**. (1 mark for Part **a**, 3 marks for Part **b**, 5 marks for Part **c**) :

3. a) Define repeatability.

b) Explain the difference between precision and accuracy.

c) For the given finite data, calculate the standard deviation.

X1 = 101.2 X2 = 101.7 X3 = 101.3 X4 = 101 X5 = 101.5 X6 = 101.3
X7 = 101.2 X8 = 101.4 X9 = 101.3 X10 = 101.1

P.T.O.



4. a) What is compensated attenuator ?
b) Draw the basic block diagram of an Oscilloscope.
c) The two deflection plates of a CRT are separated by 1 cm and the effective length of the deflection plates is 3 cm. The accelerating potential is 1200 V. Calculate the voltage required across the deflection plates to deflect an electron beam 1° .
5. a) State any three major electrical transduction principles.
b) Explain level measurement technique.
c) The maximum output of an LVDT is 5.2 V. The range of the position of the core is ± 0.5 cm. Calculate the output voltage when the core is -0.25 cm. from the centre.
6. a) What is gauge sensitivity ?
b) State the theory of operation of a resistance strain gauge.
c) A resistance strain gauge with a gauge factor 2 is mounted on a steel beam which is subjected to a strain of 1×10^{-6} . If the original resistance value of the gauge is 130Ω , calculate the change in resistance.
7. a) What is turn off time of a thyristor ?
b) Draw and explain the forward gate characteristics of a thyristor.
c) For an SCR, the gate cathode characteristic has a straight line slope of 130. For trigger source voltage of 15 V and allowable gate power dissipation of 0.5 W, compute the gate source resistance.
8. a) What is electrocardiogram ?
b) Briefly describe electromyograph.
c) Explain the basic principle of medical ultrasound scan. Mention any three advantages of MRI scan.
- (4×9=36)