M. B. Patel Science College – Anand.

T.Y B.Sc. First Internal Examination – OCT-2011.

Physics **P301**

TOTAL MARKS: 40

Date: 17/10/2011

TIME: 3.00 to 4.30 pm.

Q-1. A **Attempt any one** [07]

(1) Define and expand the Fourier's series f(x) which is a function of x that defined in an interval $(-\pi, \pi)$

(2) Define and expand the Fourier's series f(x) which is a function of x in a complex representation.

B **Attempt any one** [07]

(1) Give the physical interpretation of complex Fourier series with reference to transverse vibration of a string.

(2) Derive one dimensional wave equation and solve it.

(3) Find sines and cosines of multiple of x which represents f(x) in the interval $-\pi < x < \pi$ where,

$$f(x) = 0 \ when \ -\pi < x \leq 0$$

$$f(x) = \frac{\pi x}{4} \ when \ 0 < x < \pi$$

and hence deduce $\frac{\pi^2}{8} = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \cdots$.

Q-2 A **Attempt any one** [08]

(1) Derive Lagrange's equation of motion using D' Alembert's principle

(2) Discuss Rayleigh's dissipation function and show that dissipation of energy is twice of the Rayleigh's dissipation function. Also obtain Lagrange's equation of motion including the Rayleigh's dissipation function.

B **Attempt any one** [05]

(1) What is cyclic or ignorable coordinates? For a particle obtain Newton's equation of motion using Lagrange's equation of motion.

(2) Derive equation of motion of a bead sliding along a uniformly rotating wire in a force free field.

Q-3 A **Attempt any one** [08]

(1) Define configuration space and a system point. Also obtain first form of Euler's theorem as;

$$\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right)$$

(2) For an electrical circuit in which inductor L, capacitor C and resistor R are connected in series with a battery E obtain expressions for kinetic energy, potential energy and Rayleigh's dissipation function using electro-mechanical analogy in Lagrangian formulation.

B **Attempt any one** [05]

(1) Show that the shortest distance between two points in a plane is a straight line using variational principle

(2) Obtain Newton's equation of motion from Lagrange's equation.

Best of luck

M. B. Patel Science College – Anand.

T.Y B.Sc. First Internal Examination – OCT-2011.

Physics **P302**

TOTAL MARKS: 40

Date: 18/10/2011

TIME: 3.00 to 4.30 pm.

Q-1. A Write short notes on <u>any two</u> of the following; [10]

(i) Neutron induced fission, (ii) Fission of lighter nuclei, (iii) Fission chain reaction, (iv) breeder reactor.

B **Attempt any one**

(1) Give an account of energy released in the fission of U^{235} [03]

(2) How does one understand asymmetrical fission? Sketch the mass distribution of fission fragments for different fission chains of U^{235}

Q-2 A Write short notes on <u>any two</u> of the following; [10]

(i) quark and gluons, (ii) interaction between elementary particles, (iii) cosmic rays showers and burst , (iv) latitude effect and altitude effect.

B **Attempt any one** [03]

(1) Describe how the muons and pions are discovered experimentally in cosmic rays?

(2) How masses and times of muons and pions were determined. In what family of elementary particles they belong?

Q-3 A **Attempt any one** [08]

(1) Discuss the case of a particle in a square well potential and obtain admissible solution of wave equation.

(2) Using the admissible solution of square well potential, show that energy levels in a square well are finite and discrete.

B **Attempt any one** [06]

(1) Obtain time independent Schrodinger wave equation.

(2) In the view of admissible solutions of a square well potential discuss odd and even parity of the wave function.

Best of luck

M.B.Patel Science College, Anand

First Internal Test, 2011

T.Y.B.Sc. PHYSICS P-303

Date: 19-10-2011

Time: 03-00 to 04-30 PM Mark: 40

Que-1 (A) Attempt any ONE of the following. (07)

(i) Discuss the two types of lattice vacancies and also write the equations of equilibrium.

(ii) State the Bragg's law of diffraction and discuss the rotating crystal method in detail.

(B) Attempt any ONE of the following. (07)

(i) What are the colour centres? Discuss the possible ways to colour the crystal.

(ii) Explain the mechanism of atomic diffusion.

Que-2 (A) Attempt any ONE of the following. (07)

(i) Define superconductor and superconductivity. Explain type-i and type-ii superconductors.

(ii) Derive London equation in detail and define penetration depth.

(B) Attempt any ONE of the following. (06)

(i) What is Meissner effect? Explain Meissner effect in type-i and type-ii superconductors.

(ii) What is Josephson tunneling? Explain dc Josephson tunneling.

Que-3 (A) Write note on any THREE of the following. (13)

(i) Scanning probe instruments
(ii)Dip pen nanolithography
(iii)E-beam lithography
(iv)Nanosphere liftoff lithography
(v) Self assembly

Best Of Luck

M. B. Patel Science College – Anand.

T.Y B.Sc. First Internal Examination – OCT-2011.

Physics:P304

TOTAL MARKS: 40

Date:20/10/2011

TIME: 3.00 to 4.30 pm.

Q-1. A **Attempt any one**

(1) Obtain an expression for Maxwell's velocity distribution for ideal gas. (7)

(2) Write ergodic hypothesis and prove that mean value over an ensemble is equal to mean value over a time (7)

B **Attempt any one**

(1) Analyse completely the classical formulation of liouville's theorem. (7)

(2) Define and discuss phase space, μspace, space in detail. (7)

Q-2 A **Attempt any one**

(1) Obtain expression for canonical distribution (7)

$$P_\alpha = \frac{g_\alpha e^{-\beta E_\alpha}}{Z}$$

and give, the meaning of z.

(2) Define free energy F. Write different form of free energy in a thermodynamic system with its expression. (7)

B **Attempt any one**

(1) Derive and discuss change in entropy with the change in volume. (6)

(2) Discuss thermodynamic functions in terms of the grand partition function,

Q-3 A **Attempt any one**

(1) Define and discuss (1) Surface current density (2) Volume current density. (6)

(2) State Bio-savart law in terms of volume current density and show that divergence of magnetic field is zero. (6)

B **Attempt any one**

(1) Define current and prove that current is constant along the conducting wire. (5)

(2) Give comparison of magneto static and electrostatic. (5)

C **Attempt any one**

(1) State Bio-savart law. (3)

(2) Explain magnetic field and magnetic force (3)

----------Best of Luck----------

M. B. Patel Science College – Anand.

T.Y B.Sc. First Internal Examination – OCT-2011.

Physics : P305

TOTAL MARKS: 40

Date:21/10/2011

TIME: 3.00 to 4.30 pm.

N. B. All the symbols have their usual meanings.

Q-1. A **Attempt any one** [07]

(1) Distinguish between positive logic and negative logic system. Describe the working of AND gate and OR gate with suitable circuit diagram.

(2) Explain working of 4 bit up counter with necessary diagrams. How it is modified to count down.

B **Attempt any one** [07]

(1) Give the circuit diagram of two inputs TTL NAND gate and explain its working. How does this circuit reduce the propagation delay time?

(2) What are registers? Explain the working of four bit shift right register. State its applications.

Q-2 A **Attempt any one** [07]

(1) Mention various types of differential amplifiers. Discuss D.C. analysis of dual input balanced output configuration.

(2) State the characteristics of an ideal operational amplifier.
Obtain the expressions for voltage gain in inverting and non-inverting mode of operational amplifier. Which circuit can work as the voltage follower?

B **Attempt any one** [06]

(1) Explain the following applications of operational amplifier.
(i) Integrator (ii) Logarithmic amplifier.

(2) Define (i) input offset voltage and (ii) output offset voltage. Explain the universal balancing technique for balancing offset voltages.

Q-3 A **Attempt any one** [07]

(1) What is multiplexing? How it is used in elementary space craft and telephone system.

(2) Explain about the basic construction of a fiber optic system.

B **Attempt any one** [06]

(1) What are optical transmitters? Explain the circuit of optical transmitter using an LED.

(2) Explain the techniques used to increase channel capacity of satellite.

----------Best of Luck----------

M.B.Patel Science College, Anand

First Internal Test, 2011

T.Y.B.Sc. PHYSICS P-306

Date: 22-10-2011

Time: 12-00 to 01-00 PM Mark: 40

Que-1 (A) Attempt any ONE of the following. (07)

(i) Explain the simple flat plate collector.
(ii) Name essential subsystems and explain the thermal energy conversion scheme.

(B) Attempt any ONE of the following. (07)

(i) State merits and demerits of solar pv-system.
(ii) Give an account of Geothermal resources of energy.

Que-2 (A) Attempt any ONE of the following. (08)

(i) Derive an equation for maximum power of a wind turbine for given velocity V_i.
(ii) Name different types of HAWT and describe any one you know about.

(B) Attempt any ONE of the following. (05)

(i) Write note on Tidal range.
(ii) Give brief account on Tidal energy conversion.

Que-3 (A) Attempt any ONE of the following. (07)

(i) What is Oceanography? State six aspects of Ocean energy technologies.
(ii) Explain advantages and limitations of Ocean energy conversion technologies.

(B) Attempt any ONE of the following. (06)

(i) Give block diagram explaining Ocean energy Biomass route.
(ii) What is Fuel cell? State its salient applications.

Best Of Luck