Exam Seat No:_____ Enrollment No:_____

C.U.SHAH UNIVERSITY

WADHWAN CITY

University (Winter) Examination -2013

Course Name :M.Sc(Physics) Sem-I **Subject Name: -Mathematical Physics**

Duration :- 3:00 Hours **Date : 16/12/2013**

Instructions:-

(1) Attempt all Questions of both sections in same answer book / Supplementary.
(2) Use of Programmable calculator & any other electronic instrument is prohibited.
(3) Instructions written on main answer Book are strictly to be obeyed.
(4) Draw neat diagrams & figures (If necessary) at right places.
(5) Assume suitable & Perfect data if needed.

SECTION – I

Q-1 Do as Directed.(All Questions are compulsory) **(07)**

a) Give the solution of L $\{t^2 \sin at\}$. (02)

b) What do you mean by Piece-wise continuous function? (02)

c) Give the equation of Legendre's differential equation. (01)

d) Give Differential Equation of Hermite polynomial. (01)

e) Give the Bessel's differential Equation. (01)

Q-2 Answer the following in detail.

a) Radium decays to radon which decays to polonium. If at t=0, a sample is pure radium, how much radon does it contain at time "t"? (05)

b) Prove that Legendre's polynomials are the set of orthogonal function in the interval (-1,1) (05)

c) Prove that: $\boldsymbol{P_n}(-1)=(-\mathbf{1})^{\boldsymbol{n}}\boldsymbol{P_n}(1)$ (04)

OR

Q-2 Answer the following in detail.

a) Explain Rodrigue's formula of Legendre's Polynomials. (05)

b) Recurrence formula for Hermite polynomials. (05)

c) Solve the following ordinary differential equation $x^2\frac{dy}{dx}-2xy=\frac{1}{x}$. (04)

Q-3 Answer the following in detail.

a) Prove that : $\int_0^\infty \frac{a}{a^2+n^2}\cos nx\,dx=\frac{\pi}{2}e^{-ax}=\int_0^\infty \frac{n}{a^2+n^2}\sin nx\,dx$ (07)

b) Explain Recurrence relation for $\boldsymbol{P_n}(\boldsymbol{\mu})$. (07)

OR

Q-3 Answer the following in detail.

a) Explain Generating function of Hermite polynomials. (07)

b) Give the solution of second order linear differential equation with Variable co-efficient (07)

SECTION – II

Q-4 **Do as Directed.(All Questions are compulsory)**

a) What are the different types of transforms? List atleast four of them (02)

b) Find the Laplace transform of F(t)=t (02)

c) Define Fourier sine and cosine transforms. (02)

d) Write Mathematical form of Fourier series. (01)

Q-5 Answer the following in detail.

a) Discuss application of Fourier transform in science. (05)

b) Explain Laplace transform of Derivatives. (05)

c) Find Laplace transform of $4e^{5t}$-4cos3t+3sin4t apply in the linearity property. (04)

OR

Q-5 Answer the following in detail.

a) Explain integral formula of Laguerre's polynomial (05)

b) Find the Laplace transforms of the following functions.
(i) F(t)=e^{kt} (ii) F(t)=coskt (05)

c) Solve that: $L^{-1}\{\frac{S+1}{S^2+6S+25}\}$ (04)

Q-6 Answer the following in detail.

a) State and prove some simple properties of Laplace transform. (07)

b) Recurrence formula for Languere's polynomial. (07)

OR

Q-6 Answer the following in detail.

a) Explain inverse Laplace transforms. (07)

b) (i) Find Fourier transformation of given function: F(x) =$e^{-|x|}$. (07)
(ii) Find the Fourier sine transformation of F (t) =e^{-t}.

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