C.U.SHAH UNIVERSITY
Wadhwan City

Subject Code : 5SC01PHC1   Summer Examination-2014   Date: 10/06/2014

Subject Name:- **Mathematical Physics**

Branch/Semester:-M.Sc(Physics)/I   Time:10:30 To 1:30

Examination: Remedial

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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

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SECTION-I

Q-1   Do as Directed   **(07)**

a)   Prove $P_n(1)=1$.   (02)

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

c)   Give Equation of inhomogeneous linear second order differential equation.   (01)

d)   Write Hermite differential equation.   (01)

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

Q-2   Answer the following

a)   Give the solution of second order linear differential equation with Variable co-efficient.   (05)

b)   Explain Rodrigue's formula of Hermite polynomials.   (05)

c)   Solve $\frac{d^2y}{dx^2}+\frac{2}{x}\frac{dy}{dx}+\frac{a^2}{x^4}$ y=0   (04)

OR

Q-2   Answer the following

a)   Write short note on Generating function for Bessel's equation.   (05)

b)   Describe Integral formula for Hermite polynomials.   (05)

c)   Explain generating function for $P_n(x)$.   (04)

Q-3   Answer the following

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"?   (07)

b)   Prove that Legendre's polynomials are the set of orthogonal function in the interval (-1,1)   (07)

OR

Q-3   Answer the following in detail.

a)   Give the solution of Hermite differential equation.   (07)

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

SECTION-II

Q-4 Do as Directed.
a) What are the different types of transforms? Name them.   (02)
b) Define Inverse Laplace transformation.   (02)
c) Define Fourier sine and cosine transforms.   (02)
d) Write Mathematical form of Finite Fourier Cosine Transformation.   (01)

Q-5 Answer the following
a) Explain Laplace transform of Derivatives.   (06)
b) Give the solution of Lagurre's Differential equation.   (05)
c) Find the Laplace transform of F (t) = t.   (03)

<div align="center">OR</div>

Q-5 Answer the following
a) Explain integral formula of Laguerre's polynomial   (05)
b) Explain Differential equation for Rodrigue's formula.   (05)
c) Find the Laplace transform of F(t)= sinkt   (04)

Q-6 Answer the following
a) State and prove some simple properties of Laplace transform.   (07)
b) 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)

<div align="center">OR</div>

Q-6 Answer the following
a) Describe Recurrence formula for Langurre polynomial.   (07)
b) (i)Find the Fourier sine transformation of F(x) =x such that $0< x < 2$.   (04)

(ii)Find inverse Laplace transform of function $L^{-1}\{\frac{s}{(s^2+a^2)^2}\}$.   (03)

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