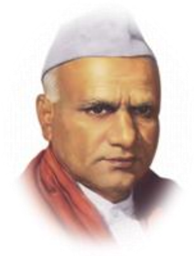

"ज्ञान, विज्ञानआणिसुसंस्कारयासाठीशिक्षणप्रसार"

शिक्षणमहर्षी-डॉ .साळुंखेबापूजी

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DEPARTMENT OF PHYSICS

QUESTION BANK

B. Sc. – III, PHYSICS (Paper-IX), DSE-E1 Mathematical Physics

Q.1 Select the correct alternative. **(1 mark each)**

1. The highest of the orders of the differential coefficients occurring in a differential equation is called …………. of the differential equation.

a) degree b) order c) linearity d) all of above

2. In a ……. Differential equation the dependent variable and all its derivatives occur in the first Order.

a) homogeneous b) non-homogeneous c) non-linear d) linear

3. The series solution method of solving different equation is especially applicable to ………differential Equations.

a) First order linear b) second order linear c) any order linear d) none of these

4. For…….. Singularity the series solution is never possible.

a) Non-essential b) irregular c) regular d) essential

5. The highest of the order of differential coefficient occurring in a differential equation is called as ….. of the differential equation.

a) Degree b) Order c) Linearity d) None of these

6. The highest of the differential coefficient occurring in a differential equation is called……of the differential equation.

a) degree b) order c) both a and b d) linearity

7. In a……..differential equation the dependent variable and all its derivatives occur in the first power.

a) homogenous b) inhomogenous c) linear d) both a and b

8. The equation $d^2y/dx2+pdy/dx+Qy=0$ is a differential equation

a) homogenous second order linear b) inhomogenous second order linear

c) homogeneous first order linear d) homogeneous first order non linear

9. The series solution method of differential equation is especially applicable to…. Differential equations

a) 1^{st}order linear b) 1^{st} order nonlinear c) any order linear d) 2^{nd} order linear

10. For ……. Singularity the series solution is never possible.

a) non-essential b) essential c) regular d) irregular

Q. 2 Long answer type questions. (08 Marks each)

a) Obtain the solution of Laplace equation in two dimensions by separation of variable method.

b) Solve the equation $(\partial^2 u/\partial x^2 - \partial^2 u/\partial t^2)$ =0 by method of separation of variables.

c) Explain the method of separation of variables for solving 3-D.

d) By method of separation of variables solve the equation of wave form $\frac{\partial 2u}{\partial x2}$ = $1/c^2 \frac{\partial 2u}{\partial t2}$.

e) Explain the method of separation of variables for solving the equation $\frac{\partial 2u}{\partial x2}=\frac{\partial u}{\partial t}$.

f) Explain the method of separation of variables for solving the equation $\frac{\partial 2u}{\partial x2}$ = $1/k^2 \frac{\partial 2u}{\partial t2}$.

g) Define ordinary point, regular singularity and irregular singularity of the second order differential equation and illustrate them with help of example.

h) Find the general solution of the Legendre's differential equation by Forbenious Method.

i) Define Bessel's Differential equation and solve it by using series solution method.

j) Explain the Forbenious method for solving the equation, $a_0(x)\frac{d2y}{dx2} + a_1 \frac{dy}{dx} + a_2(x)y=0$.

k) Find the general solution of the equation $\frac{d2y}{dx2} + x\frac{dy}{dx} + 3y = 0$ by Forbenious Method.

l) Defines the Beta ad Gamma functions and prove that $\beta(m,n)=\int_0^\infty \frac{xm-1}{(1+x)m+n}dx$.

m) Derive the relation between beta and gamma functions.

n) Prove that beta function is symmetric and show that $\int_0^\infty \frac{dx}{(1+x)4}=\Pi/2\sqrt{2}$.

o) Represents the complex numbers $z_1.z_2$ and z_1/z_2 geometrically for any two complex z_1 and z_2.

p) Using Euler’s formulas prove the De’Moiver’s theorem.

q) State and prove the Cauchy- Riemann Conditions for a function to be analytic.

r) Prove the log Z= log |z| +I arg z, hence find the value of log (-1,-i).

Q. 3 Short answer type questions. **(4 Marks each)**

a) What are the differential equation, explain them with examples.

b) Write a note on law of equi-partition energy.

c) Explain Microstate and Macro state.

d) Explain molecular speed.

e) Deduce the relation between entropy and probability.

f) Write a note on radiation pressure.