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**PG CBCS**  
**M.Sc. Semester-I Examination, 2020**  
**PHYSICS**  
PAPER: PHS-101

**Full Marks: 40**

**Time: 2 Hour**

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**Write the answer for each unit in separate sheet**

The figures in the right-hand margin indicate full marks.  
Candidates are required to give their answers in their own words as far as practicable

**101.1: Mathematical Physics**

**Marks: 10**

**Answer any TWO questions of the following:**

**10×2**

1. Define analytic Function. State Cauchy Riemann's theorem.
2. Explain the methodology of Matrix Diagonalization.
3. What are Linearly dependent and Linearly independent basis in vector space? Cite examples.
4. What are regular and irregular singular points in differential equation? Cite examples.
5. What are generating function and polynomial of a differential equation?
6. Explain Gram-Schmidt Orthogonalization process.

*(Turn Over)*

(2)

**101.2: Classical Mechanics****Marks: 10****Answer any TWO questions of the following:****10×2**

1. Write a note on holonomic and non-holonomic constraints with two examples of each type. Derive Lagrange's equation from D'Alembert's principle. **4+6**
2. What do you mean by virtual work? What is the advantage of using the concept of virtual work? Describe the superiority of Lagrangian approach over Newtonian approach. Derive the equation of motion of a particle moving under central force. **3+3+4**
3. Define generalized momentum and cyclic coordinate. Explain quantitatively when the Hamiltonian (H) becomes equal to the total energy of the system? What are action-angle variables? **4+4+2**
4. What are canonical transformations? What do you mean by generating function? Obtain canonical transformation equations corresponding to the generating function  $F_3$ . **2+2+6**
5. What are Lagrange and Poisson bracket? Discuss their physical significance. Show that Poisson bracket of two functions F and G does not obey commutative law but obeys distributive law of algebra. **2+2+6**
6. Discuss Hamilton-Jacobi theory. In what circumstance is the characteristic function W more useful than the special function S? Explain how action-angle variables can be used to obtain the frequencies of periodic motion. **5+5**

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