Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 20

M.Sc. (Physics) (2018 Onwards Batch) (Sem.–1)

MATHEMATICAL PHYSICS–I

Subject Code : MSPH-411-18

M.Code : 75122

Time : 3 Hrs. Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION-B contains SEVEN questions carrying FIVE marks each and students have to attempt any SIX questions.
3. SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.

SECTION-A

Answer briefly :

1. State Cauchy Riemann conditions. What is an analytic function? Discuss briefly beta function.
2. Write an expression for generating function of Legendre polynomials.
3. Express the orthonormality condition of Bessel functions.
4. Write an expression for generalized Hermite differential equation and corresponding solution.
5. Discuss the role of random variables in statistics.
6. Differentiate between Poisson and Normal distribution.
7. Six cards are drawn at random from a pack of 52 cards. What is the probability that 3 will be red and 3 black?
8.
9.
10. Find the independent solutions of the equation $\frac{d^2y}{dx^2} - 3\frac{dy}{dx} - 2y = 0$.

SECTION-B

11. State and prove Cauchy's integral formula.

12. Discuss the factorial notation and applications of Gamma functions.

13. Obtain two recurrence relations of Associate Legendre polynomials.

14. Explain the method of separation of variables by taking a suitable example.

15. Write an expression for generating function of Bessel functions. Prove that the Bessel functions can be generated from it.

16. Prove Rodrigue's formula for evaluation of Legendre polynomials.

17. Differentiate between discrete and continuous probability distributions.

SECTION-C

18. Solve Legendre differential equation by power series method.

19. Evaluate $I = \int_0^{\infty} \frac{x^2}{(x^2+a^2)(x^2+b^2)}\,dx$ where a, b > 0 using the calculus of residues.

20. a) What are Hermite and Laguerre functions?

    b) Discuss importance of beta functions.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.