16P207   (Pages: 2)   Name.....................

Reg. No....................

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY-2017

(Regular/Supplementary/Improvement)

(CUCSS - PG)

CC 15P PHY2 C06 - MATHEMATICAL PHYSICS-II

(Physics)

(2015 Admission Onwards)

Time:Three Hours   Maximum: 36 Weightage

SECTION A

Answer *all* questions

Each question carries a weightage of **1**

1. Check the analyticity of the complex function $f(z) = \ln z$.

2. Find the residue of $\dfrac{z^3 - z^2 + 1}{z^3}$ at infinity.

3. State and prove Cauchy's integral theorem.

4. State and explain rearrangement theorem.

5. What are Lie groups?

6. What are the features of an SO(2) group?

7. Explain the classes of integral equations.

8. What do you mean by a separable Kernel? Give an example.

9. What idea does the Euler equation convey if x does not appear explicitly in the integrand i.e., $f = f(y, y_x)$?

10. Explain Rayleigh-Ritz variational technique.

11. What are the properties of a 3-D Green's function.

12. Prove the symmetric property of Green's function.

(12 x 1 = 12 weightage)

SECTION B

Answer any *two* questions

Each question carries a weightage of **6**

13. Derive Cauchy Reimann conditions and explain the concept of analyticity. Also, express the C-R conditions in polar form.

14. Define homomorphism. Explain the homomorphism between SU(2) and SO(3) groups.

15. Derive Euler's equation by applying variational principle. How can it be generalized for the case of several dependent and several independent variables?

16. Illustrate with the help of the linear oscillator problem that the initial or boundary conditions play a decisive role in the transformation of a linear, second-order ODE into an integral equation.

(2 x 6 = 12 weightage)

1

SECTION C

Answer any *four* questions

Each question carries a weightage of **3**

17. Find the residues of $f(z) = \frac{ze^{iz}}{z^4+a^4}$ at its poles.

18. Evaluate by the method of residues the integral $\int_0^{2\pi} \frac{d\theta}{a+b\cos\theta}$.

19. If G is a group denoting the symmetry transformations of a square, determine its subgroups.

20. Show by variational method, the shortest distance between two points in a plane is a straight line.

21. Using the Neumann series, solve the equation $\phi(x) = 1 - 2\int_0^x t\,\phi(t)dt$.

22. Using Green's function method, find the solution of the oscillator equation y"(x) + λy(x) = 0 with boundary conditions y(0) = y(1) = 0.

(**4 x 3 = 12 weightage**)

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