17P211 (Pages: 2) Name:…...………..……..…

Reg. No……………..……..

SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY 2018

(Regular/Supplementary/Improvement)

(CUCSS - PG)

CC15P PHY2 C06 / CC17P PHY2 C06 – MATHEMATICAL PHYSICS - II

(Physics)

(2015 Admission onwards)

Time: Three Hours Maximum: 36 Weightage

Section A

Answer ***all*** questions. Each question carries 1 weightage.

1. What is meant by singularity of a function? Give its classifications.
2. Give Cauchy's integral formula.
3. What are the advantages of integral equations over differential equations?
4. What is Neumann series? What is its significance?
5. Define cosets classes and invariant groups.
6. State and prove Lagrange's theorem .
7. Distinguish between reducibility and irreducibility.
8. Give the generators of SU(3) group.
9. Using Fermat's principle and Calculus of variations, prove rectilinear propagation of light.
10. Explain Rayleigh-Ritz variational technique.
11. Give one application of Euler equation
12. Show that

$G(x, t) = x$, for $0 \leq x < t$

$G(x, t) = 1$, for $t \leq x < 1$

is the Green function for the operator $L = d^2/dx^2$ at the boundary conditions $y(0) = 0$, $y'(1) = 0$.

(12 x 1 = 12 Weightage)

Section B

Answer any ***two*** questions. Each question carries 6 weightage.

13. Construct Greens function for 1d Sturm-Liouville operator and show that it is the solution of the Sturm-Liouville equation using integral differential equation.
14. What do you mean by Isomorphism and Homomorphism. Discuss the

homomorphism between SU(2)and SO(3)groups

15. a) Obtain Cauchy- Reimann conditions in polar form.

    b) State and prove Cauchys integral theorem.

16. What is Lagrangian multiplier in calculus of variation? Illustrate with example. Mention the advantages and specify the case at which it fails.

(2 x 6 = 12 Weightage)

Section C

Answer any ***four*** questions. Each question carries 1 weightage.

17. Evaluate the integral $\int_{-\infty}^{\infty} \frac{dx}{a + bcosx}$ with $a > 0, b > 0$

18. A rectangular parallelepiped is inscribed in an ellipsoid of semiaxes a, b, and c. Maximize the volume of the inscribed rectangular parallelepiped. Find the ratio of the maximum volume to the volume of the ellipsoid

19. Find the eigen function and eigen value for $y'' + \lambda y = 0$ with y(0) = 0 and $y(1) = 0$ using Rayleigh Ritz variational technique

20. Derive a Fredholm integral equation corresponding to

$$y''(x) - y(x) = 0, y(1) = 1, \; y(-1) = 1.$$

21. Show that 2x2 matrices of the form

$$\begin{bmatrix} \cos\theta & -sin\theta \\ sin\theta & \cos\theta \end{bmatrix}$$

form a group under matrix multiplication.

22. Find the Eigen values and Eigen functions of the following integral equation by separable kernel technique.

$$\varphi(x) = \lambda \int_{-1}^{1} (t + x)\phi(t)dt$$

(4 x 3 = 12 Weightage)

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