Reg. No... Name.. **18U437**

B. Sc. DEGREE END SEMESTER EXAMINATION MARCH 2018

SEMESTER **– 4: MATHEMATICS (COMPLEMENTARY COURSE FOR PHYSICS AND CHEMISTRY)**

COURSE: **15U4CPMAT4: FOURIER SERIES, DIFFERENTIAL EQUATIONS, NUMERICAL ANALYSIS AND ABSTRACT ALGEBRA**

Common for Regular (2016 Admission) & Supplementary (2015 & 2014 Admissions)

Time: Three Hours Max. Marks: 75

PART A

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

1. Define a periodic function.
2. Write Bessel function of the first kind of order n.
3. Write Legendre's equation.
4. Define partial differential equation.
5. Give an example for a first order partial differential equation in 3 variables.
6. Write a parametric equation of the spherical surface $x^2 + y^2 + z^2 = a^2$.
7. Write generalized Newton's formula.
8. Define Absolute error.
9. Give an example for an abelian group.
10. Define a ring. (1 x 10 = 10)

PART B

Answer ***any eight*** questions. Each question carries ***2*** marks.

11. Define even and odd functions with examples.
12. Show that $\Gamma(v+1) = v\Gamma(v)$.
13. Write the Legendre polynomial of degree n.
14. Eliminate the constant a and b from the equation $2z = (ax+y)^2 + b$
15. If F = $ax^2 + by^2 + cz^2 - 1$ and G= x + y +z - 1 then find $\frac{\partial(F,G)}{\partial(y,z)}$..
16. Evaluate the sum $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ to 4 significant digits and find its absolute and relative errors.
17. Explain Newton Raphson Method for finding root of an equation.

18. If $u=3v^7-6v$, find the percentage error in *u* at *v* = 1 ,if the error in *v* is 0.05.

19. Show that every cyclic group is abelian.

20. Define a vector space. (2 x 8 = 16)

PART C

Answer ***any five*** questions. Each question carries ***5*** marks.

21. Find the Fourier series of the function $f(x)=\begin{cases} 0, if\ -2<x<-1 \\ k\ , if\ -1<x<1 \\ 0\ , if\ 1<x<2 \end{cases}$, *p* = 2L = 4

22. Solve $y'-y=0$ using power series method.

23. Find the integral curves of the equations $\frac{dx}{y(x+y)+az}=\frac{dy}{x(x+y)-az}=\frac{dz}{z(x+y)}$

24. Eliminate the arbitrary function *f* from the equation $z=xy+f\left(x^2+y^2\right)$

25. Find a real root of the equation $x^3-x-1=0$ using bisection method.

26. Explain the Quotient – Difference method to find root of an equation. Illustrate with a cubic Polynomial.

27. Show that the set of real numbers is a field with usal addition and multiplication. (5 x 5 = 25)

PART D

Answer ***any two*** questions. Each question carries ***12*** marks.

28. Find the Fourier series of the function $f(x)=\begin{cases} 1, if\ -\pi<x<0 \\ -1, if\ \ 0<x<\pi \end{cases}$ and $f(x+2\pi)=f(x)$

29. Find the general integral of the linear partial differential equation $z(xp-yq)=y^2-x^2$.

30. Using the method of false position find a real root of the equation $f(x)=x^3-2x-5=0$.

31. (a) Show that Q^+ with the operation $*$ defined by $a*b=\frac{ab}{2}$ is a group.

    (b) Show that the identity element and inverse of each element are unique in a group.

    (c) Let A be a nonempty set and S_A be the collection of all permutations of A. Then show that S_A is a group under permutation multiplication. (12 x 2 = 24)