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S.NO. 75

BATCH: 2017

Reg. No.

END OF SEMESTER EXAMINATIONS, APRIL/MAY - 2018
MATHEMATICAL PHYSICS - I
SUBJECT CODE: 17P3PH02

MAJOR: M.Sc. (Physics)
TIME : 3 HOURS

SEMESTER : I
MAX. MARKS: 70

SECTION – A (10 X 1 = 10)

Answer ALL the Questions:

Choose the best answer:

1. The line integral $\int_C A \cdot dr$ is independent of path, then the vector field $A(x, y, z)$ is
 - a) Non-Conservative
 - b) Conservative
 - c) Associative
 - d) Non of the above
2. Laplace transforms of $\sin h(at) =$ _____.
 - a) $\frac{s}{s^2 - a^2}$
 - b) $\frac{s}{s^2 + a^2}$
 - c) $\frac{a}{s^2 - a^2}$
 - d) $\frac{a}{s^2 + a^2}$
3. A function that is analytic at all points of the Z-plane and finite at infinity _____.
 - a) must have a singularity
 - b) must be zero
 - c) must be a constant
 - d) cannot exit
4. The value of Bessel's function $J_0(0)$ is
 - a) Zero
 - b) One
 - c) Two
 - d) None of these
5. Which of the following is not a method of finding roots of an algebraic equation?
 - a) Newton-Raphson method
 - b) Secant method
 - c) Lagrange's method
 - d) None of these
6. Define orthogonal set.
7. Define Dirichlet's conditions.
8. Define Cauchy's Integral Formula.
9. Define Bessel's differential equation.
10. Define Gauss elimination method.

SECTION – B (5 X 4 = 20)

Answer ALL the Questions:

11. a) Write short notes on (i) Surface (ii) Volume integrals
(OR)
 - b) Write note on Inner Product and Unitary Space.
12. a) Write the uses of Fourier Series.
(OR)
 - b) Write the Linearity property of Laplace Transforms.
13. a) Derive expression for line integral of a Complex Function.
(OR)
 - b) State and prove Cauchy Residue Theorem.

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14. a) Show that $nP_n = (2n-1)x P_{n-1} - (n-1)P_{n-1}$.

(OR)

b) Show that $P_n(-x) = (-1)^n P_n(x)$.

15. a) Using Newton-Raphson method. Obtain a root of $\sin x = 1 - x$ to three decimals.

(OR)

b) Derive expression for Simpson's one-third rule.

SECTION - C (5 X 8 = 40)

Answer ALL the Questions:

16. a) State and prove Gauss divergence theorem.

(OR)

b) Describe the Schmidt Orthogonalisation procedure of constructing an orthogonal set.

17. a) Find Laplace transforms of (i) $\sin(at)$ (ii) $\cos(at)$ (iii) $\sin^2 t$ (iv) $\cos^2 t$

(OR)

b) State and explain Dirichlet's Theorem.

18. a) State and prove Cauchy's Integral Theorem.

(OR)

b) State and prove Laurent's Series.

19. a) Show that Rodrigue's formula for Legendre Polynomials of $P_n(x) = \frac{1}{2^n n!} \frac{d^n}{dx^n} (x^2 - 1)^n$.

(OR)

b) State Bessel's differential equation, with its independent solutions.

20. a) Apply Gauss elimination method to solve the following simultaneous linear equations:

$$3x + 4y + 5z = 18$$

$$2x - y + 8z = 13$$

$$5x - 2y + 7z = 20$$

(OR)

b) Use (i) Trapezoidal rule (ii) Simpson's One-third rule, to evaluate the approximate value of

$$\int_0^1 \frac{dx}{1+x}$$
 correct to 3 decimals taking $h = 0.25$.
