## SECTION – C [3.X 10 = 30]

**Answer any THREE Questions.**

16. Determine the analytic function whose real part is
$x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.

17. Find the poles and residues at the poles for the function $\frac{z+1}{z^2-2z}$.

18. Derive the covariant form of Maxwell's equation.

19. List the 5 simple rules to work out the character table taking $(D_3)$ the group of equilateral triangle as an example.

20. Show that the normal distribution is a limiting case of binomial distribution.

Reg. No:

# G .T.N. ARTS COLLEGE (AUTONOMOUS)

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## END SEMESTER EXAMINATION - APRIL 2019

**Programme : M.Sc. Physics** **Date : 02.05.2019**

**Course Code : 18PPHC21** **Time : 10.00 a.m. to 1.00 p.m**

**Course Title : Mathematical Physics - II** **Max Marks :75**

## SECTION – A [10 X 1 = 10]

**Answer ALL the Questions.**

**Choose the Correct Answer.**

1. The function $f(z) = z^3$ with $z = x + iy$ is analytic _____
   [a] in entire z-plane [b] for positive values of x
   [c] only at x = 0, y = 0 only [d] on the line y = 1 only

2. The function $f(z) = |z|^2$ with $z = x + iy$ is _____
   [a] differentiable for all avlues of x and y
   [b] differentiable for only positive values of x and y
   [c] differentiable at x = 0,y = 0 only
   [d] differentiable only at x = 1 and y = 1

3. The residue of the function $f(z) = z^2/z^2+4$ at z = 2i is _____
   [a] $e^{i\pi/2}$ [b] $e^{i\pi}$
   [c] $e^{3i\pi/2}$ [d] $e^{-i\pi/2}$

4. If a function f(z) has poles only in the finite part of the z - plane, then the function is said to be _____
   [a] Laurent's function [b] Liouville's function
   [c] Residue function [d] Meromorphic function

Kronecker delta $\delta^{\nu}{}_{\mu}$ in n –dimensional space is _____.

[a] 0 [b] 1 [c] μ [d] n

A tensor of rank 2 in n dimensional space has _____ components.

[a] n [b] 2n [c] $n^2$ [d] $2^n$

If A and b are two elements of a group G under multiplication, then the element of the group g must be _____.

[a] A + B [b] A – B

[c] AB [d] $A/B$

If any two elements A and B of a group commute, then the group is said to be _____.

[a] cyclic group [b] abelian group

[c] non – abelion group [d] power group

From the pack of 52 cards, one is drawn at random, the probability of getting a king is _____.

[a] 1/13 [b] 2/13 [c] 1/169 [d] 25/169

In a given race, the odds in favor of horses A,B,C are 1:3, 1:4,1:5,1:6 respectively. The probability that the horse C win the race is _____.

[a] 1/4 [b] 1/5 [c] 1/6 [d] 1/3

**SECTION – B** **[5 X 7 = 35]**

**Answer ALL the Questions.**

11. a) (i) Define an analytic function.

(ii) Show that $d/dz(Z^2) = 2Z$.

**[OR]**

b) Use C-R condition to find out whether the function cosh z is analytic.

12. a) Find the residue of $\frac{\sin Z}{1-Z^4}$ at $Z = i$.

**[OR]**

b) Find $R(-1/2)$ and $R(5)$ for the function

$f(Z) = \frac{Z}{(2Z+1)(5-Z)}$

13. a) Briefly describe the concept of sub groups. Also explain the two trivial subgroups of a group.

**[OR]**

b) Prove that the covering operations of an equilateral triangle form a group homomorphic onto the group of elements (1,-1).

14. a) Explain the occurrence of tensor in physics taking electrical conductivity of the medium as an example.

**[OR]**

b) State the transformation condition of a rank 2.

(i) Contravariant tensor (ii) Covariant Tensor (iii) Mixed Tensor

15. a) (i) State the conditional probability of Baye's formula.

(ii) A preliminary text is customarily given to the students at the beginning of a certain course. The following data are accumulated after several years.

a) 95% of the students pass the course, 5% fail

b) 96% of the students who pass the course also passed the preliminary text.

c) 25% of the students who fail the course passed the preliminary test. What is the probability that a student who has failed the preliminary test will pass the course?

**[OR]**

b) The radius of a wire is measured in cm as 0.17, 0.15, 0.18, 0.19, 0.16, 0.17. Find the mean radius and standard deviation.

## SECTION – C [ 3 X 10 = 30 ]

**Answer any THREE Questions.**

16. Verify divergence theorem for the vector

$\hat{A} = x^2\hat{i} + y^2\hat{j} + z^2\hat{k}$ taken over the cube $0 \le x, y, z \le 1$.

17. Find the Eigen values and normalized Eigen vector of the matrix.

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

18. Obtain Fourier series for the expansion f (x) = x sin x in the interval - $\pi < x < \pi$. Hence deduce that $\frac{\pi}{4} = \frac{1}{2} + \frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \ldots\ldots$

19. If n is a positive integer, prove that

$\int_{-1}^{+1} p_n(x)(1 - 2xz + z^2)^{-\frac{1}{2}}\, dx = \frac{2z^n}{2n+1}$ and hence, making use of Rodrigue's formula, deduce that

$\int_{-1}^{+1} (1-x^2)^n (1 - 2xz + z^2)^{-n-(1/2)}\, dx = \frac{2^{2n+1}(n!)^2}{(2n+1)}$.

20. Derive the solution of Laplace's Equation in spherical polar coordinate.

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## END SEMESTER EXAMINATION - APRIL 2019

Programme : **M.Sc Physics** Date : **02.05.2019**

Course Code: **18PPHC11** Time : **2.00 p.m. to 5.00 p.m.**

Course Title : **Mathematical Physics -I** Max Marks : **75**

## Section – A [10 X 1 = 10]

**Answer ALL the Questions.**

**Choose the Correct Answer.**

1. The projection of vector $\hat{a} = 2\hat{i} - 3\hat{j} + 6\hat{k}$ on the vector $\hat{b} = \hat{i} + 2\hat{j} + 2\hat{k}$ _____.

   [a] 8/5 [b] 8/3 [c] 8/7 [d] 8/9

2. A vector field which can be expressed as negative gradient of a scalar is called _____.

   [a] Lamellar field [b] Non- Lamellar field

   [c] Non – conservative field [d] conservative field

3. If **r** is a position vector, then curl r is _____.

   [a] 0 [b] 3

   [c] $r^{-2}r$ [d] $r^{3/2}$

4. If $F = (3x - 4y + az)\hat{i} + (cx + 5y - 2z)\hat{j} + (x - by + 7z)\hat{k}$ irrotational then the value of a, b,c is _____.

   [a] 1, 2,-4 [b] -4, 2, 1

   [c] 2, 1,-4 [d] -4, 2, 1

The average of the function f(x) = sinx in the interval $(0, \pi)$ is _____.

[a] 1/2 [b] $2/\pi$ [c] $1/\pi$ [d] $4/\pi$

6. Fourier transform of which of the following functions does not exist?

[a] $e^{-|x|}$ [b] $xe^{-x^2}$ [c] $e^{x^2}$ [d] $e^{-x^2}$

7. The incorrect equation among the following is _____.

[a] $P_0(x) = 1$ [b] $P_1(x) = 1$

[c] $P_n(-x) = (-1)^{n+1} P_n(x)$ [d] $P_1(x) = -1$

8. $J_3(x)$ can be written in terms of $J_0(x)$ as _____.

[a] $J_0(x)$ [b] $(8x^2 -1)J_1-4x^{-1}J_0$

[c] $(8x^2 +1)J_1-4x^{-1}J_0$ [d] $(8x^2 -1)J_1+4x^{-1}J_0$

9. $(x^2D)^2 + 5xD =4)\ y = 0$ is a homogeneous linear differential equation of order 2_____.

[a] true [b] false [c] partially true [d] None

10. Which of the following is an exact differential equation?

[a] $dy/dx = 2x-y/x+2y-5$ [b] $(y^2e^x + 2xy)dx-x^2dy = 0$

[c] $xdy- ydx =xy^2dx$ [d] None

## SECTION – B [ 5 X 7 = 35 ]

**Answer ALL the Questions.**

11. a) Using Stokes theorem, prove the following relation

i) $\iint_s ds \times \nabla\Phi = \oint \Phi\, dl$

ii) $\iint_s (ds \times \nabla) = \oint dl \times F$

**[OR]**

b) Express the velocity and acceleration of a particle in cylindrical coordinates.



12. a) (i) outline the Schmitt's orthogonalisation.
(ii) State and prove Schwarz inequality

**[OR]**

b) Find the characteristic equation of the following matrix and verify the Cayley - Hamilton theorem

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & 1 \end{bmatrix}$$

13. a) Expand the function f(x) = sin x as a cosine series in the interval $(0,\pi)$.

**[OR]**

b) Find the Fourier transform of $e^{-r^2/a^2}$ where a is a constant and $r = \sqrt{x^2} + y^2 z^2$.

14. a) Prove that m is an integer less than n, then

$$\int_{-1}^{1} x^m P_n(x)dx = 0$$

$$\int_{-1}^{+1} x^m\, p_n\,(x)\, dx = 2^{n+1}\,(n!)^2 / (2n+1)!$$

**[OR]**

b) Prove the recurrence formula for Hermite polynomials.

15. a) Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$; subject to coordinates

U (0, y) = u (l, y) = u (x, 0) = 0 and

$U(x, 0) = \sin \frac{x\pi x}{l}$.

**[OR]**

b) Give brief explanation about solution of Laplace's Equation in Cartesian coordinates.

## SECTION – C

**Answer any THREE Questions.** [3 X 10 = 30]

16. Determine the analytic function whose real part is

$x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$.

17. Find the poles and residues at the poles for the function $\frac{z+1}{z^2-2z}$.

18. Derive the covariant form of Maxwell's equation.

19. List the 5 simple rules to work out the character table taking $(D_3)$ the group of equilateral triangle as an example.

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# G .T.N. ARTS COLLEGE (AUTONOMOUS)

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## END SEMESTER EXAMINATION - APRIL 2019

**Programme : M.Sc. Physics** **Date : 02.05.2019**

**Course Code : 18PPHC21** **Time : 10.00 a.m. to 1.00 p.m.**

**Course Title : Mathematical Physics - II** **Max Marks :75**

## SECTION – A

**Answer ALL the Questions.** [10 X 1 = 10]

**Choose the Correct Answer.**

1. The function $f(z) = z^3$ with $z = x + iy$ is analytic _____.

   [a] in entire z-plane [b] for positive values of x

   [c] only at $x = 0, y = 0$ only [d] on the line $y = 1$ only

2. The function $f(z) = |z|^2$ with $z = x + iy$ is _____

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   [c] differentiable at $x = 0, y = 0$ only

   [d] differentiable only at $x = 1$ and $y = 1$

3. The residue of the function $f(z) = z^2/z^2+4$ at $z = 2i$ is _____

   [a] $e^{i\pi/2}$ [b] $e^{i\pi}$

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4. If a function f(z) has poles only in the finite part of the z – plane , then the function is said to be _____.

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   [c] Residue function [d] Meromorphic function

Kronecker delta $\delta^{\mu}_{\mu}$ in n –dimensional space is _____.

[a] 0 [b] 1 [c] $\mu$ [d] n

A tensor of rank 2 in n dimensional space has _____ components.

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If A and b are two elements of a group G under multiplication, then the element of the group g must be _____.

[a] A + B [b] A – B

[c] AB [d] $A/B$

If any two elements A and B of a group commute, then the group is said to be _____.

[a] cyclic group [b] abelian group

[c] non – abelion group [d] power group

From the pack of 52 cards, one is drawn at random, the probability of getting a king is _____.

[a] 1/13 [b] 2/13 [c] 1/169 [d] 25/169

10. In a given race, the odds in favor of horses A,B,C are 1:3, 1:4,1:5,1:6 respectively. The probability that the horse C win the race is _____.

[a] 1/4 [b] 1/5 [c] 1/6 [d] 1/3

**SECTION – B** **[5 X 7 = 35]**

**Answer ALL the Questions.**

11. a) (i) Define an analytic function.

(ii) Show that $d/dz\,(Z^2) = 2Z$.

**[OR]**

b) Use C-R condition to find out whether the function cosh z is analytic.



12. a) Find the residue of $\frac{\sin z}{1-z^2}$ at $Z = 1$

**[OR]**

b) Find $R(-1/2)$ and $R(5)$ for the function

$$f(Z) = \frac{z}{(2Z+1)(5-Z)}$$

13. a) Briefly describe the concept of sub groups. Also explain the two trivial subgroups of a group.

**[OR]**

b) Prove that the covering operations of an equilateral triangle form a group homomorphic onto the group of elements (1,-1).

14. a) Explain the occurrence of tensor in physics taking electrical conductivity of the medium as an example.

**[OR]**

b) State the transformation condition of a rank 2.

(i) Contravariant tensor (ii) Covariant Tensor (iii) Mixed Tensor

15. a) (i) State the conditional probability of Baye's formula.

(ii) A preliminary text is customarily given to the students at the beginning of a certain course. The following data are accumulated after several years.

a) 95% of the students pass the course, 5% fail

b) 96% of the students who pass the course also passed the preliminary text.

c) 25% of the students who fail the course passed the preliminary test. What is the probability that a student who has failed the preliminary test will pass the course?

**[OR]**

b) The radius of a wire is measured in cm as 0.17, 0.15, 0.18, 0.19, 0.16, 0.17. Find the mean radius and standard deviation.

## SECTION – C [ 3 X 10 = 30 ]

**Answer any THREE Questions.**

16. State and describe the principle of least action.
17. Define differential scattering cross section. Explain the Rutherford's alpha particle scattering to find scattering cross section.
18. Discuss briefly about Liouville's theorem.
19. Explain and deduce the Eigen value equation and the principle axes transformation.
20. Formulate the Kepler's problem by Hamilton - Jacobi's method.

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## END SEMESTER EXAMINATION - APRIL 2019

Programme : **M.Sc. Physics**
Course Code: **18PPHC12**
Course Title : **Classical Mechanics**

Date: **04.05.2019**
Time: **2.00 p.m. to 5.00 p.m.**
Max Marks: **75**

## SECTION – A [10 X 1 = 10 ]

**Answer ALL the Questions.**
**Choose the Correct Answer.**

1. In the "D"Alembert's principle, _____.
   [a] Applied forces do not appear
   [b] Dynamic system is not included
   [c] Forces of constraints do not appear
   [d] Forces of constraints appear
2. The Lagrange's equation of motion $\frac{d}{dt}\left(\frac{\partial L}{\partial q_i}\right)-\left(\frac{\partial L}{\partial q_i}\right)=0$ can be used for.
   [a] Conservative and non- holonomic systems
   [b] Conservative and holonomic systems
   [c] Non- conservative and holonomic systems
   [d] Non- conservative and non-holonomic systems
3. Choose the odd one which is not related to the Rutherford formula for scattering cross section.
   [a] Square of the charge on the particle
   [b] Inversely proportional to the square of the initial kinetic energy of

5. If the point y is in outside the interval $(x_1, x_n)$ then the estimation of f(y) is called _____.

[a] interpolation [b] extra interpolation

[c] short interpolation [d] long interpolation

6. The value of cos 0.16 is _____.

[a] 1.0118 [b] 1.0218

[c] 1.0128 [d] 1.228

7. Formula for numeric integration is called _____.

[a] differentiation [b] interpolation

[c] quadration [d] intergration function

8. Gauss legendre formula is _____.

[a] $f(x) = a_1 + a_2x + a_3x^2 + a_4x^3$

[b] $f(x) = a_1 - a_2x - a_3x^2 - a_4x^3$

[c] $f(x) = a_1 - a_2x - a_3x - a_4x$

[d] $f(x) = a_1 - a_2x$

9. Fitting function f(x) minimized to sum of sauares of the deviations called _____.

[a] least square fit [b] curve fit

[c] circular fit [d] edge fit

10. Runge -kutta second order method also called _____.

[a] Heun's method [b] Iterative method

[c] Gauss method [d] Rampson method

## SECTION – B

**Answer ALL the Questions.** [ 5 X 7 = 35 ]

11. a) Find the real root of the equation $x^3 + x^2 = 1$ by iteration method.

**[OR]**

b) Find a real root of equation $x^3 - x - 11 = 0$ by Bisection method.

12. a) Describe the Algorithm to implement the Gauss- Seidal method.

**[OR]**

b) Discuss the comparison of direct and iterative methods.

13. a) Using Newton's forward interpolation formula, find the value of y when x=2 from the following tabulated values of the function.

| X | 20 | 23 | 26 | 29 |
|---|---|---|---|---|
| Y | 0.3420 | 0.3907 | 0.4384 | 0.4848. |

**[OR]**

b) Write an Algorithm to discuss the linear regression method.

14. a) Derive the formula for Numerical integration .Discuss in detail.

**[OR]**

b) Using Euler's method, find y(0.4) given $\frac{dy}{dx} = xy$, y(0)= 1.

15. a) Write down the solution of Second order differential equation( Runge Kutta method).

**[OR]**

b) Use the Trapezoidal rule with h=1/2 , h=1/4 to Evaluate $\int_0^1 f(x)dx$ and the data given below.

| X | 0.000 | 0.250 | 0.500 | 0.750 | 1.0000 |
|---|---|---|---|---|---|
| Y | 0.79788 | 0. 77334 | 0.70413 | 0.60227 | 0.48394. |

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## END SEMESTER EXAMINATION - APRIL 2019

**Programme : M.Sc. Physics**
**Course Code : 18PPHC23**
**Course Title : Statistical Mechanics & Thermodynamics**

**Date : 07.05.2019**
**Time : 10.00 a.m. to 1.00 p.m.**
**Max Marks :75**

### SECTION – A [10 X 1 = 10]

**Answer ALL the Questions.**
**Choose the Correct Answer.**

1. Change of heat depends on _____.

   [a] the transfer of heat [b] change of temperature

   [c] transfer of mass [d] the thermodynamic State

2. A system is said to be in a state of unstable equilibrium when _____

   [a] dG<0,dF<0,ds<0 [b] dG<0,dF<0,ds>0

   [c] dG>0,dF>0,ds>0 [d] dG>0,dF>0,ds<0

3. At equilibrium the total Gibb's free energy for all phases is_____

   [a] Minimum [b] Maximum

   [c] Infinity [d] Zero

4. The temperature at which the solid melts at 1 atm is called _____

   [a] Normal boiling point [b] Normal melting point

   [c] Normal freezing point [d] Normal thermal point

5. The condition in which the quantum statistics reduces to classical statistics is _____.

[a] $\rho\lambda^3 = 1$ [b] $\rho\lambda^3 >> 1$

[c] $\rho\lambda^3 << 1$ [d] $\rho = 0$

6. Phase space plot of both a particle, momentum and _____ on a two dimensional graph is a system of state.

[a] position [b] energy

[c] magnitude [d] velocity

7. The number of independent properties required to completely fix the equilibrium state of a gaseous compound state is _____.

[a] 4 [b] 3

[c] 2 [d] 1

8. In a equilibrium condition Black body Radiation is considered as _____.

[a] photon gas [b] denser gas

[c] packets [d] radiation spectrum.

9. The particle obeys with integral multiple of 1 are_____.

[a] Bosons [b] fermions

[c] mesons [d] none of the above

10. Diffusion and _____ are the combination of Brownian motion represents a single phenomenon in gas particles.

[a] concentration [b] radiation

[c] dissipation [d] filteration

## SECTION – B

[5 X 7 = 35]

**Answer ALL the Questions.**

11. a) Write a note on combined first and second laws of thermodynamic

**[OR]**

b) Explain phase transition.

12. a) Brief Phase rule. What does happen at triple point of water?

**[OR]**

b) What is a reversible voltaic cell? Explain.

13. a) Brief energy states and energy levels.

**[OR]**

b) Explain macrostates and microstates.

14. a) Write a note on B.E. Statistics.

**[OR]**

b) Brief thermodynamic properties of a system.

15. a) Describe the principle of equipartition of energy?.

**[OR]**

b) Explain black body radiation.

## SECTION – C

[3 X 10 = 30]

**Answer any THREE Questions.**

16. Brief thermodynamic potentials.

17. Write notes on surface tension phenomenon and vapour pressure of liquid drop.

18. Explain Liouville's theorem and its consequences.

19. Brief F.D. distribution function.

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## END SEMESTER EXAMINATION - APRIL 2019

**Programme : M.Sc. Physics** | **Date : 04.05.2019**
**Course Code: 18PPHC22** | **Time : 10.00 a.m. to 1.00 p.m.**
**Course Title : Electromagnetic Theory** | **Max Marks :75**

### SECTION – A [10 X 1 = 10]

**Answer ALL the Questions.**
**Choose the Correct Answer.**

1. The negative gradient of electrostatic potential is _____.
   [a] Potential energy [b] Volume charge density
   [c] Surface charge density [d] Electric field

2. A point dipole has an electric field due to _____
   [a] it's charges [b] it's dipole moment
   [c] the extended charge distribution [d] electric flux

3. The force on a wire of length L with current I in a magnetic field of induction B perpendicular to the wire-length is given by _____
   [a] BIL [b] LI [c] BI [d] BL

4. One tesla is _____.
   [a] newton per coulomb [b] newton per meter
   [c] weber-meter [d] weber per (meter)$^2$

5. Ampere's circuital law can be compared in parallel to _____
   [a] Coulomb's law [b] Biot-Savart-law

6. In free space, the divergence of magnetic induction is equal to _____.

[a] zero [b] magnetic potential

[c] magnetic flux [d] magnetic moment

7. The relation between the wavelength $\lambda$ and wave number k is given by _____.

[a] $k = (\lambda / 2\pi)$ [b] $k = 2\pi\lambda$

[c] $(1 / k) = (\lambda / 2\pi)$ [d] $(\lambda / k) = 2\pi$

8. The average power per unit area transported by an electromagnetic wave is called _____.

[a] Momentum [b] Intensity

[c] Amplitude [d] Frequency

9. Lienard-wiechert potentials refer to _____.

[a] moving point charge [b] static point charge

[c] point dipole [d] multipoles

10. The divergence of the gradient is called _____.

[a] the electrostatic potential [b] the laplacian operator

[c] the Poisson's operator [d] the electric field intensity

## SECTION – B [5 X 7 = 35]

**Answer ALL the Questions.**

11. a) Solve the Laplace's equation in spherical polar coordinates for a problem of a dielectric sphere in a uniform electric field.

**[OR]**

b) List out the applications of Gauss's law.

12. a) Obtain an expression for force on a current carrying conductor.

**[OR]**

b) State and explain the Biot-Savart law.

13. a) Explain how Maxwell fixed Ampere's law.

**[OR]**

b) Obtain expressions for Maxwell's equations in electrodynamics.

14. a) Derive the wave equations for $\overline{E}$ and $\overline{B}$ in vacuum.

**[OR]**

b) Obtain the Maxwell's equations for electromagnetic waves propogate in a linear media.

15. a) Discuss in detail about the Gauge Transformation.

**[OR]**

b) Derive the time-dependent generalization of Coulmb's law and Biot-Savart law, to which it reduces in the static case.

## SECTION – C [3 X 10 = 30]

**Answer any THREE Questions.**

16. Write a short notes on i) The electric field inside a dielectric and ii) Gauss law in the presence of dielectric.

17. Derive an expression for magnetic vector potential.

18. Obtain an equation for energy stored in the magnetic field.

19. Discuss the propogation of electromagnetic waves in conductors.

20. Derive the equation for Lienard-Wiechart potentials.

Reg. No:

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## END SEMESTER EXAMINATION - APRIL 2019

Programme : **M.Sc. Physics** Date : **07.05.2019**
Course Code: **18PPHC13** Time : **2.00 p.m.** to 5.0
Course Title : **Applied Electronics** Max Marks : 75

### SECTION – A [10 X 1

**Answer ALL the Questions.**
**Choose the Correct Answer.**

1. The input impedance of a JFET is _____ that of an ordina transistor.
   [a] equal to [b] less than
   [c] more than [d] none of the above
2. MOSFET has greatest application in digital circuit due to _____
   [a] Low power consumption
   [b] Less noise
   [c] Small amount of space it takes on a chip
   [d] All of the above
3. The differential gain is _____.
   [a] very high [b] very low
   [c] dependent on input voltage [d] about 100
4. The op-amp can amplify _____.
   [a] a.c. signal only [b] d.c. signal only

5. An oscillator produces _____ oscillations.

[a] damped [b] undamped

[c] modulated [d] none

6. Hartley oscillator is commonly used in _____.

[a] Radio receivers [b] Radio transmitters

[c] TV receivers [d] none of the above

7. The truth table for an S-R flip flop has how many valid entries?

[a] 1 [b] 2 [c] 3 [d] 4

8. A decimal counter has _____ states.

[a] 5 [b] 10 [c] 15 [d] 20

9. Which of the following is not a type of memory?

[a] RAM [b] FPROM [c] EEPROM [d] ROM

10. How many types of RAMS are?

[a] 2 [b] 3 [c] 4 [d] 5

**SECTION – B** **[ 5 X 7 = 35 ]**

**Answer ALL the Questions.**

11. a) Sketch the basic structure of a n channel FET. Explain its drain characteristics.

**[OR]**

b) Explain how FET can act as an amplifier.

12. a) Draw a complementary Emitter-follower circuit. Discuss in detail.

**[OR]**

b) Describe how the slew rate of an Operational amplifier can be improved.



13. a) Draw the circuit of square and triangular wave generators. Explain in detail.

**[OR]**

b) Describe the principle and working of a IC555 timer.

14. a) Discuss the system for 4 bit odd parity checker. Explain the operation of the system.

**[OR]**

b) Define a Multiplexer. Draw a logic diagram of 4-to-1 line Multiplexer. Explain in detail.

15. a) Draw a dynamic MOS shift Registers. Briefly explain its operation.

**[OR]**

b) How does a Microcomputer differ from a Microprocessor? Discuss in detail

**SECTION – C** **[ 3 X 10 = 30 ]**

**Answer any THREE Questions.**

16. Draw the circuit symbols used to MOSFETS. Explain

(a) Enhancement mode MOSFET (b) depletion mode MOSFET

17. Discuss the measurements of OP-Amp parameters and explain its frequency response and compensation.

18. Sketch the phase shift oscillator using (a) an Op-Amp and (b) a JFET and explain their working.

19. Draw a clocked J-K flipflop system. Give its truth table and explain its operation. What is race around problem?

20. Write a note on CCD (Charge Coupled Device) structures.

Reg. No:

# G .T.N. ARTS COLLEGE (AUTONOMOUS)

*(Affiliated to Madurai Kamaraj University)*
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## END SEMESTER EXAMINATION - APRIL 2019

**Programme : M.Sc. Physics**
**Course Code : 18PPHE21**
**Course Title : Nano Physics**

**Date : 09.05.2019**
**Time : 10.00 a.m. to 1.00 p.m**
**Max Marks :75**

### SECTION – A

[10 X 1 = 1

**Answer ALL the Questions.**
**Choose the Correct Answer.**

1. Nanosize powder particles are also called _____.

   [a] nanotubes [b] nanostructures
   [c] nanoparticles [d] nanodots

2. Example of quasi-2 dimensional is _____

   [a] nanowires [b] quantum wells
   [c] quantum dots [d] aerogels

3. Themesoscopic range is _____

   [a] 10-100nm [b] 10-1000nm
   [c] 1-10000nm [d] 10-100000nm

4. 1 micron = _____.

   [a] 10nm [b] 1000nm
   [c] 100nm [d] 10000nm

6. Vapour phase deposition can be used to fabricate _____.

[a] rigid bodies [b] cantelevers

[c] thin films [d] semiconductors

7. Nanoparticle consists of _____ layers.

[a] 1 [b] 2

[c] 3 [d] 4

8. Most of the atoms in nanoclusters are _____ atoms.

[a] centre [b] bottom

[c] surface [d] single

9. A quantum well is _____ with discrete energy values.

[a] energy well [b] potential well

[c] mechanical well [d] temperature well

10. Quantum wire is _____ conducting wire.

[a] a thermal [b] an electrical

[c] a surface [d] a core

## SECTION – B

**Answer ALL the Questions.** **[5 X 7 = 35]**

11. a) Explain the detection of secondary and backscattered electrons in scanning electron microscope.

**[OR]**

b) Explain imaging structures of scanning probe microscopy.

12. a) Explain the chemical vapour deposition multiwall nanotube tip preparation.

**[OR]**

b) Explain photolithography and its limitations.

13. a) Explain plasma arc discharge for deposition of carbon nanotube.

**[OR]**

b) Explain briefly the film deposition in a DC glow discharge.

14. a) Explain the electronic structure of nanoparticles.

**[OR]**

b) Explain the application of carbon nanotubes in computers.

15. a) Explain the steps in the formation of quantum wire or quantum dot.

**[OR]**

b) Explain the size effect of quantum nanostructure.

## SECTION – C

**Answer any THREE Questions:** **[3 X 10 = 30]**

16. Explain the working principle of Transmission Electron Microscope.
17. Discuss imaging modes and measuring images with AFM.
18. Explain the formation of nanomaterial by Sol-gel method.
19. Explain the fabrication of carbon nanotubes.
20. Explain the formation of microelectromechanical systems.