UG–AS-264 **BMSS–11**

U.G. DEGREE EXAMINATION —
JULY 2022.

Mathematics

(From CY – 2020 onwards)

First Semester

ALGEBRA

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

1. Solve the equation $x^3 + 6x + 20 = 0$ one root being $1 + 3i$.

2. Find the equation whose roots are the roots of $x^4 - x^3 - 10x^2 + 4x + 24 = 0$ increased by 2.

3. Define Symmetric matrix.

4. Find the number of divisors of 360?

5. State Fermet's theorem.

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

6. Solve the equation $32x^3 - 48x^2 + 22x - 3 = 0$ whose roots are in Arithmetic Progression.

7. Sum the series $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \ldots$

8. Show that the matrix $\frac{1}{3}\begin{bmatrix} 2 & 2 & 1 \\ -2 & 1 & 2 \\ 1 & -2 & 2 \end{bmatrix}$ is orthogonal.

9. Explain Euler's function $\phi(N)$.

10. Find the product of all divisions of N.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

11. Solve the reciprocal equation
$6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$.

12. Find the sum to infinity of the series
$1 + \frac{3}{1!} + \frac{5}{2!} + \frac{7}{3!} + \ldots$

13. Verify Cayley–Hamilton theorem for $A = \begin{bmatrix} 1 & 0 & 3 \\ 2 & 1 & -1 \\ 1 & -1 & 1 \end{bmatrix}$

14. Show that the number of divisors of an integer is odd if and only if the integer is a square.

15. State and prove Wilson's theorem.

16. Solve the equation $27x^3 + 42x^2 - 28x - 8 = 0$ whose roots are in geometric progression.

17. Find the eigen values and eigen vectors of $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$.

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UG–AS–265 BMSSE–11

U.G. DEGREE EXAMINATION — JULY, 2022.

Mathematics

(From CY – 2020 Onwards)

First Semester

TRIGNOMETRY

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions.Each in 100 words.

1. Prove $\frac{\sin 5\theta}{\sin\theta} = 5 - 20\sin^2\theta + \sqrt{6\sin^4\theta}$.

2. Write the expansion of $\tan 7\theta$ in terms of $\tan\theta$.

3. Write the formula for $\cosh z$?

4. Find the value of $Log(4+3i)$.

5. Write some types of summation of trigonometric series.

PART B — (3 × 7 = 21 marks)

Answer any THREE questions. Each in 200 words.

6. Prove that

$$\cos 8\theta = 1 - 32\sin^2\theta + 160\sin^4\theta - 256\sin^6\theta + 128\sin^8\theta$$

7. Prove $16\cos^5\theta = \cos 5\theta + 5\cos 3\theta + 10\cos\theta$.

8. Prove that $\sinh^{-1} x = \log_e(x + \sqrt{x^2 + 1})$.

9. Prove that $\log\dfrac{a+ib}{a-ib} = 2i\tan^{-1}\dfrac{b}{a}$.

10. Prove that $\tan\dfrac{\pi}{12} = \left(1 - \dfrac{1}{3^{1/2}}\right) - \dfrac{1}{3}\left(1 - \dfrac{1}{3^{1/2}}\right) + \ldots\infty$.

PART C — (4 × 10 = 40 marks)

Answer any FOUR questions. Each in 500 words.

11. Prove
$\cos 7\theta = 64\cos^7\theta - 112\cos^5\theta + 56\cos^3\theta - 7\cos\theta$.

12. If $\dfrac{\sin x}{x} = \dfrac{863}{864}$ find an approximation value of x.

13. Separate into real and imaginary parts of $\tan(x + iy)$.

14. Show that $\log \tan\left[\frac{\pi}{4}+\frac{ix}{2}\right]=i\tan^{-1}[\sinh x]$.

15. Prove that

$$1-\frac{1}{2}\cos\theta+\frac{1}{2}.\frac{3}{4}\cos 2\theta-\frac{1.3.5}{2.4.6}\cos 3\theta+\ldots=\frac{\cos\frac{\theta}{4}}{\sqrt{2\cos\frac{\theta}{2}}}$$

16. Expand $\sin^3\theta\cos^4\theta$ interms of sine multiple of θ.

17. If $\sin(A+iB)=(x+iy)$ prove that

(a) $\frac{x^2}{\cosh^2 B}+\frac{y^2}{\sinh^2 B}=1$

(b) $\frac{x^2}{\sin^2 A}-\frac{y^2}{\cos^2 A}=1$

UG–AS-266	BPHYSA–11

U.G. DEGREE EXAMINATION — JULY, 2022.

Physics

(From CY – 2020 batches)

First Semester

ALLIED PHYSICS – I

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of five questions in 100 words.

All questions carry equal marks.

1. Give the laws of vibration of stretched string.
2. State and explain Hook's law
3. What are reversible and irreversible process?
4. Explain Fleming's right hand rule
5. What are aberrations? State the types of aberration?

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words. All questions carry equal marks.

6. What are the factors affecting the acoustic quality of a building? Explain in detail.

7. Discuss Poiseuille's method for determining the coefficient of viscosity of a liquid.

8. Explain the properties of He I and He II.

9. Explain the working of a choke coil.

10. Explain dispersion without deviation and deviation without dispersion.

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words. All questions carry equal marks.

11. With a neat diagram, explain the construction and working of a Magneto striction oscillator. List out the properties of Ultrasonics waves.

12. Describe the torsional pendulum with necessary theory.

13. Discuss the liquefaction of air and Explain adiabatic demagnetization.

14. State and explain Biot and Savart law. Obtain the expression for the field along the axis of a current carrying circular coil.

15. Describe an experiment to determine the refractive index of a liquid by measuring its apparent depth.

16. What is Bending of Beam? Deduce the expression for bending moment and explain the theory of non-uniform bending.

17. Obtain the condition for dispersion without deviation for the combination of two narrow angle prisms.

UG-AS-267	BMSS-21

U.G. DEGREE EXAMINATION — JULY 2022.

Mathematics

(From CY – 2020 onwards)

Second Semester

DIFFERENTIAL CALCULUS

Time : 3 hours Maximum marks : 70

SECTION A — (3 × 3 = 9 marks)

Answer any THREE questions each in 100 words.

1. If $y = a\cos 5x + b\sin 5x$ show that $\frac{d^2y}{dx^2} + 25y = 0$.

2. If $u = x^2y + 3xy^4$ where $x = e^t$, and $y = \sin t$ find $\frac{du}{dt}$.

3. Write the Cartesian Formula to find the radius of curvature.

4. Find the angle between the radius vector and the tangent at any point on the conic section $\frac{l}{r} = 1 + e\cos\theta$.

5. Write briefly about asymptotes.

PART B — $(3 \times 7 = 21$ marks)

Answer any THREE questions.

6. If $y = e^{a\sin^{-1}x}$ show that $(1 + x^2)y_2 + xy_1 - a^2y = 0$.

7. Verify that $\frac{\partial^2 u}{\partial x\,\partial y} = \frac{\partial^2 u}{\partial y\,\partial x}$ if $u = x\sin y + y\sin x$.

8. Find the radius of curvature at the point $\left(\frac{a}{4}, \frac{a}{4}\right)$ to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$.

9. Find the slope of the tangent to the curve $r = a(1 - \cos\theta)$ at $\theta = \pi/2$.

10. Find all the asymptotes of the curve.

$$y^3 - x^2y - 2xy^2 + 2x^3 - 7xy + 3y^2 + 2x^2 + 2x + 2y + 1 = 0$$

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions.

All questions carry equal marks.

11. Find the n[th] derivative for $y = \dfrac{1}{(2x+1)(2x-1)}$.

12. If $u = x^3 + y^3 + z^3 + 3xyz$ show that

$$x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 3u.$$

13. Show that the radius of curvature at 't' on the curve $x = 6t^2 - 3t^4; y = 8t^3$ is $6t(1+t^2)^2$.

14. Find the angle of intersection of the curves.

$$r = \frac{a}{1+\cos\theta} \text{ and } r = \frac{b}{1-\cos\theta}.$$

15. Find the asymptotes of the curve

$$x^3 + 2x^2y - xy^2 - 2y^3 + 4y^2 + 2xy + y - 1 = 0$$

16. If $y = a\cos(\cos x) + b\sin(\cos x)$ prove that $x^2 y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$.

17. Find the maximum and minimum values of $f(x,y) = x^4 + y^4 - 4xy + 1$.

UG–AS-268	**BMSSE–21**

U.G. DEGREE EXAMINATION — JULY 2022.

Mathematics

(From CY – 2020 onwards)

Second Semester

ANALYTICAL GEOMETRY

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions.

1. Write any two properties of conjugate diameters of an ellipse.

2. Write the general form of polar equation of a straight line.

3. Find the equation of the plane containing the parallel lines.

   $$\frac{x-3}{1} = \frac{y-2}{-4} = \frac{z-1}{5} \text{ and } \frac{x-1}{1} = \frac{y+1}{-4} = \frac{z-2}{5}$$

4. Find the equations of the plane passing through the line $\frac{x-1}{1}=\frac{y-2}{-2}=\frac{z-3}{3}$ and $\frac{x-1}{1}=\frac{y-2}{-2}=\frac{z-3}{3}$ and passing through the point (4,5,1)

5. Find the centre and radius of the sphere $16x^2+16y^2+16z^2-16x-8y-16z-55=0$

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions.

6. If CP and CD be pair of semi conjugate diameter then prove that CP^2+CD^2 is a constant.

7. Show that the locus of the perpendicular drawn from the pole to the tangent to the circle $r=2a\cos\theta$ is $r=a(1+\cos\theta)$

8. Find the equation of the projection of a line $\frac{x-1}{2}=\frac{y+1}{-1}=\frac{z-3}{4}$ on the plane $x+2y+z=6$

9. Show that the lines $\frac{x+4}{3}=\frac{y+6}{5}=\frac{z-1}{-2}$ and $3x-2y-z+5=0=2x+3y+4z-4$ are coplanar.

10. Find the equation of the sphere whose centre is $(1,-3,4)$ and which passes through the points $(3,-1,3)$

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions.

11. A tangent to the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ whose centre C meets the circle $x^2+y^2=a^2+b^2$ at Q and Q' prove that CQ and CQ' are conjugate diameter of the ellipse.

12. In the hyporbole $16x^2-9y^2=144$ find the equation of the diameter conjugate to the diameter $x=2y$

13. Obtain the equation of the line lying in the plane $x-2y+4z-51=0$ and the intersecting the line $\frac{x-2}{3}=\frac{y+1}{4}=\frac{z-6}{7}$ at right angles.

14. Find the shortest distance and equation to the line of shortest distance between the two given lines $\frac{x+7}{3}=\frac{y+4}{4}=\frac{z+3}{-2}$ and $\frac{x-21}{6}=\frac{y+5}{-4}=\frac{z-2}{-1}$

15. Show that the lines

$x+2y+3z-4=0, 2x+3y+4z-5$

and $2x-3y+3z-5=0$, $3x-2y+4z-6$ are coplanar and find the equation of the plane in which thes lie.

16. Find the equation of the sphere which touches the coordinate axes, whose centre lie in the positive octant and radius 4.

17. Find the equation of the sphere passing through the points (1, 0, –1), (2, 1, 0), (1, 1, –1) and (1, 1, 1).

UG-AS-269 **BPHYSA-22**

U.G. DEGREE EXAMINATION – JULY, 2022.

Physics

(From CY–2020 onwards)

Second Semester

ALLIED PHYSICS - II

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions out of Five questions in 100 words.

All questions carry equal marks.

1. Give the importance of Velocity of light.

2. What are the limitations of Rutherfored's model of the atom?.

3. What do you understand by mass defect of a nucleus?

4. Explain the postulates of Special theory of relativity?

5. What is Zener diode? Explain with diagram.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions out of Five questions in 200 words.

All questions carry equal marks.

6. Explain how the phenomenon of interference is used in testing the optical planeness of glass surface.

7. Write a note on coupling schemes.

8. Explain carbon - nitrogen cycle and proton-proton cycle.

9. Discuss the time dilation and give its significance.

10. Draw and explain the operation of RC phase shift oscillator.

PART C — ($4 \times 10 = 40$ marks)

Answer any FOUR questions out of Seven questions in 500 words.

All questions carry equal marks.

11. Explain the principle of air wedge. Explain how an air wedge can used to find the diameter of a thin wire.

12. Explain in detail how the rectilinear propagation of light is explained by Fresnel.

13. State Pauli's exclusion principle and explain how it helped in fixing up the electronic configuration of the elements in periodic table.

14. Describe the Stern and Gerlach experiment and indicate the importance of the results obtained.

15. Describe a G.M. counter and explain its working as a particle detector.

16. Derive the time dependent and time independent Schrodinger wave equation.

17. Explain the working of a full-adder with an example. Give the function table with necessary diagram.