| UG–AS-282 | BPHYS–21 |
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# U.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

Second Semester

MECHANICS

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. Explain potential energy curve.

2. Find the radius of gyration of a disc of mass M and radius R rotating about an axis passing through the centre of mass and perpendicular to the plane of the disc.

3. State newton's law of gravitation.

4. What is center of mass?

5. Explain Equation of Continuity.

PART B — ($3 \times 7 = 21$ marks)

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

All questions carry equal marks.

6. Derive the relation for coefficient of restitution.

7. Derive an expression form of circular ring and disc.

8. Derive the expression gravitational potential due to spherical shell.

9. Two point masses 3 kg and 5 kg are at 4 m and 8 m from the origin on X-axis. Locate the position of centre of mass of the two point masses

   (a) from the origin and

   (b) from 3 kg mass.

10. Explain the angle and cone of friction in detail.

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 conservative and non-conservative forces in detail.

12. Deduce the parallel and perpendicular axes theorem. Explain their significances.

13. Derive the variation of acceleration due to gravity (g) at different regions of earth.

14. Derive the expression for the acceleration of a rolling body in an inclined plane.

15. Explain the Bernoulli's theorem and its application.

16. Deduce the expression for the centre of pressure in a vertical triangular lamina.

17. Derive the expression to determine the acceleration due to gravity and radius of gyration.

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# U.G. DEGREE EXAMINATION — JULY 2022.

Mathematics

(From CY – 2020 onwards)

Second Semester

ALLIED MATHEMATICS – 2

Time : 3 hours Maximum marks : 70

PART A — ($3 \times 3 = 9$ marks)

Answer any THREE questions.

1. Define Beta function.

2. Evaluate $I = \int_0^1 \frac{1}{1+x} dx$ by Simpson's rule using the following table and correct to three decimal places.

| | | | |
|---|---|---|---|
| x | 0 | 0.5 | 1.0 |
| y | 1.000 | 0.666 | 0.5000 |

3. Evaluate $\int_0^1 \int_0^2 (x^2 + y^2) dxdy$

4. Find $L\left[e^{-at}\right]$

5. Define correlation.

PART B — (3 × 7 = 21 marks)

Answer any THREE questions.

6. Using Beta function, integrate $\int_0^1 x^7(1-x)^3 dx$

7. Using Newton's forward interpolation formula to find $y$ at $x = 8$ from the following table

| | | | | | | |
|---|---|---|---|---|---|---|
| x | 0 | 5 | 10 | 15 | 20 | 25 |
| y | 7 | 11 | 14 | 18 | 24 | 12 |

8. Evaluate $\int_0^1\int_0^1\int_0^1 (x+y+z)dxdydz$

9. Find $L^{-1}\left[\frac{1}{(s+1)(s+3)}\right]$

10. Compute coefficient of correlation for the following data thrush Pearson's method.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| x | 5 | 7 | 3 | 1 | 9 | 12 | 8 | 3 |
| y | 8 | 9 | 5 | 4 | 9 | 13 | 7 | 9 |

PART C — $(4 \times 10 = 40$ marks)

Answer any FOUR questions.

11. Prove that $\Gamma(n+1) = n!$

12. The population of a certain town (as obtained from census data is shown in the following table.

| Year | 1921 | 1931 | 1941 | 1951 | 1961 |
|---|---|---|---|---|---|
| Population | 19.96 | 39.65 | 58.81 | 77.21 | 94.61 |

Estimate the population in the year 1963

13. Evaluate the following integral by change the order of integration

$$\int_0^\infty \left[ \int_x^\infty \frac{e^{-y}}{y} dy \right] dx$$

14. Solve $\frac{d^2y}{dt^2} - \frac{dy}{dt} - 2y = 0$ given $y(0) = -2; y'(0) = 5$ by using Laplace transformation techniques.

15. Calculate rank correlation between the ranks given of x and y series.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| x | 10 | 8 | 1 | 2 | 6 | 9 | 3 | 5 | 4 | 7 |
| y | 6 | 10 | 5 | 4 | 3 | 1 | 2 | 9 | 8 | 7 |

16. Find $\int_{7.47}^{7.48} y\,dx$ from the following table using trapezoidal rule h=0.01

| | | | | | | |
|---|---|---|---|---|---|---|
| x | 7.47 | 7.48 | 7.49 | 7.50 | 7.51 | 7.52 |
| y | 1.93 | 1.95 | 1.98 | 2.01 | 2.03 | 2.06 |

17. Calculate Karl Pearson's coefficient of correlation from the following data.

| | | | | | | |
|---|---|---|---|---|---|---|
| x | 10 | 12 | 18 | 24 | 23 | 27 |
| y | 13 | 18 | 12 | 25 | 30 | 10 |

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# U.G. DEGREE EXAMINATION — JULY 2022.

Physics

(From CY – 2020 onwards)

First Semester

PROPERTIES OF MATTER AND SOUND

Time : 3 hours Maximum marks : 70

PART A — (3 × 3 = 9 marks)

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

All questions carry equal marks.

1. Define Young's Modulus. List out few examples for Young's Modulus.

2. Define Surface Tension and Surface energy.

3. List out the parameters that affects the viscosity of gases.

4. What is Simple Harmonic Oscillator?

5. List out the applications of Ultrasonic waves.

PART B — $(3 \times 7 = 21$ marks)

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

All questions carry equal marks.

6. Derive the relation between Elastic Moduli.

7. Give the explanation of surface tension on kinetic energy.

8. Explain the determination of viscosity of liquid using stokes method.

9. State and verify Laws of Transverse Vibration.

10. Explain the factors affecting the acoustics of building.

PART C — $(4 \times 10 = 40$ marks)

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

All questions carry equal marks.

11. What is Cantilever? Derive the expression for work done of beam.

12. Explain the Dynamic torsion method for determining the rigidity modulus of an object.

13. Deduce the expression for the excess pressure inside a liquid drop, soap bubble and acting inside a curved liquid surface.

14. Explain the Rankine's method of determining the viscosity of gases in detail.

15. Explain the Magnetostriction method in detail for the production of ultrasonic waves and List out the properties of ultrasonic waves.

16. Explain the Lissajous plots for simple harmonic motion at various phase differences.

17. What is Capillarity? Deduce the Poiseuille's expression to determine the rate of flow of liquid in a capillary tube.

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**UG–AS–281** **BMSSA–11**

U.G. DEGREE EXAMINATION —
JULY, 2022.

Mathematics

(From CY – 2020 Onwards)

First Semester

ALLIED MATHEMATICS – I

Time : 3 hours Maximum marks : 70

PART A — (3 × 3 = 9 marks)

Answer any THREE questions. Each in 100 words

1. State Cayley – Hamilton theorem.

2. Find the $n^{th}$ derivative for $y = e^{ax}$.

3. Form the partial differential equation by eliminating a and b from $z = ax + by + a^2 + b^2$.

4. Write the Fourier series expansion for $f(x)$ in $(0,2\pi)$.

5. State a Linear programming problem.

PART B — ($3 \times 7 = 21$ marks)

Answer any THREE questions.

6. Verify cayley-Hamilton Theorem for the matrix $A = \begin{bmatrix} 1 & 3 & 7 \\ 4 & 2 & 3 \\ 1 & 2 & 1 \end{bmatrix}$.

7. Find the n[th] derivative for $y = \dfrac{1}{(x+1)(x+3)}$.

8. Solve: $p^2 + q^2 = 4$

9. Find the Fourier series of the function $f(x) = \dfrac{1}{2}(\pi - x) \;\; 0 < x < 2\pi$.

10. Solve the following Linear programming problem by graphical method.

    Maximize $z = 2x_1 + 3x_2$

    Subject to the constraints

    $3x_1 + 2x_2 \le 12$

    $3x_1 + 5x_2 \le 15$

    $x_1, x_2 \ge 0$

PART C — (4 × 10 = 40 marks)

Answer any FOUR questions.

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

12. If $y = e^{a \sin^{-1} x}$ prove that

$$(1 - x^2) y_{n+2} - (2n+1) x y_{n+1} - (n^2 + a^2) y_n = 0.$$

13. Solve $x^2 p + y^2 q = z^2$.

14. Determine Fourier expansion for $f(x) = \begin{cases} -\pi & 0 < x < \pi \\ x - \pi & \pi < x < 2\pi \end{cases}$.

15. Explain the procedure to solve linear programming problem by simplex method.

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

17. Find the n<sup>th</sup> derivative for $x^2 e^{5x}$.