

MATHEMATICS (New course)

Section-A

Multiple Choice Questions (MCQ's)

Q.1 Choose the correct answer for each from the given options.

- (i) For two sets A and B, if $O(A) = O(B)$ then
(a) $A \subset B$ (b) $B \subset A$ (c) $A \cap B$ (d) $A \cup B$
- (ii) $((A')') =$ _____
(a) A' (b) A (c) $A \cup B$ (d) B
- (iii) Which operation is not commutative
(a) Symmetric difference (b) Union (c) Difference (d) Intersection
- (iv) Which one is subset of N
(a) Z (b) Q (c) E (d) P
- (v) Tabular form of $A = \{x \mid x \in Z \wedge x^2 = 25\}$ is
(a) {1,5} (b) {-5,5} (c) {1,5,25} (d) {-5}
- (vi) One and only one circle passes through three points.
(a) collinear (b) non-collinear (c) disjoint (d) none of these
- (vii) The hypothesis of the enunciation "If two chords of a circle are congruent, then they are equidistant from the centre" is:
(a) two chords of a circle are equidistant from the centre.
(b) two chords of a circle are congruent.
(c) a circle has two chords.
(d) the centre of circle is equidistant from chords.

(viii) The hypothesis of the enunciation "One and only one circle can pass through three non-collinear points" is:

- (a) three points are non-collinear.
- (b) one and only one circle passes through three points.
- (c) two circles pass through three points.
- (d) three points are collinear.

(viii) The conclusion of the enunciation "One and only one circle can pass through three non-collinear points" is:

- (a) three points are non-collinear.
- (b) one and only one circle passes through three points.
- (c) two circles pass through three points.
- (d) three points are collinear.

(ix) A circle is an example of a curve.

- (a) simple and closed
- (b) simple and open
- (c) non-simple and closed
- (d) non-simple and open

(x) The conclusion of the enunciation "If two chords of a circle are congruent, then they are equidistant from the centre." is:

- (a) two chords of the circle are equidistant from the centre.
- (b) two chords of a circle are congruent.
- (c) a circle has two chords.
- (d) the centre of circle is equidistant from chords.

(xi) In the adjacent figure, the point of tangency is .

- (a) A
- (b) B
- (c) C
- (d) D

(xii) Tangents drawn at end points of a diameter of a circle are to each other

- (a) parallel
- (b) perpendicular
- (c) intersecting
- (d) both (b) and (c)

(xiii) The maximum number of common tangents between two circles touching internally is _____

- (a) 0 (b) 1 (c) 2 (d) 3

(xiv) The maximum number of common tangents between two circles touching externally is _____

- (a) 0 (b) 1 (c) 2 (d) 3

(xv) If a point is outside the circle then from this point we can draw tangent(s) to the circle.

- (a) one (b) two (c) three (d) none

(xvi) Angle between the radial segment and tangent at its outer end point is _____

- (a) 45° (b) 60° (c) 90° (d) 120°

(xvii) In the adjacent figure, circles with centres E and C _____

- (a) touch internally (b) touch externally
(c) do not touch (d) are congruent

(xviii) In the adjacent figure, circles with centres B and C have _____ point(s) of contact.

- (a) no (b) one (c) two (d) none of these

(xix) In adjacent figure, circles with centres E and C have point(s) of contact.

- (a) no (b) one (c) two (d) none of these

(xx) In the adjacent figure, AB is _____

- (a) tangent (b) secant (c) chord (d) none of these

Section-B

Note: Attempt any 08 question of the following:

Q.2 Write any five example of empty sets.

Q.3 Which of the following sets are disjoint, overlapping, exhaustive and cells.

(i) $\{1, 2, 3, 5, 7\}$ and $\{4, 6, 8, 9, 10\}$ (ii) $\{1, 2, 3, 6\}$ and $\{1, 2, 4, 8\}$

Q.4: If, A and B are subset of U then prove the following using properties.

(i) $A \cup (A \cap B) = A \cap (A \cup B)$ (ii) $A \cup B = A \cup (A' \cap B)$

(iii) $B = (A \cap B) \cup (A' \cap B)$ (iv) $B = A \cup (A' \cap B)$, if $A \subseteq B$

Q.5 If $a : b = 5 : 8$, find the value of $3a + 4b : 5a + 7b$

Q.6 Find the value of x in the following contained proportions.

(i) 45, x, 5 (ii) 7, x - 3, 112

Q.7 Solve the equations:

(i)
$$\frac{(x+3)^2 - (x-5)^2}{(x+3)^2 + (x-5)^2} = \frac{4}{5}$$

(ii)
$$\frac{\sqrt{x+1} + \sqrt{x-1}}{\sqrt{x+1} - \sqrt{x-1}} = \frac{1}{2}$$

Q.8 If y varies directly as x^2 and z and $y = 6$ when $x = 4$, $z = 9$. Write y as a function of x and z determine the value of y when $x = -8$, and $z = 12$.

Q.9 If $p:q = r:s$ then show that $(p^2+q^2): \frac{p^3}{p+q} = (r^2+s^2): \frac{r^3}{r+s}$

For the matrices $A = \begin{bmatrix} -1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 2 & 3 \\ -2 & 4 & 1 \\ 3 & 2 & 1 \end{bmatrix}$. Find

Q.10:

- (i) $A+B$ (ii) $A-B$ (iii) $3A+2B$
 (iv) AB (v) BA (vi) A^2

Q.11 For what value of x , the matrix $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ is singular?

Q.12 Construct histogram for the following data with unequal class intervals:

Class limits	0-39	40-49	50-79	80-99
Frequencies	6	8	12	4

Section-C

Note: Attempt any 04 Question of the following:

Q.13 Resolve the following fractions into partial functions:

- (i) $\frac{9x^2+5x+7}{x(x+2)(x-5)}$ (ii) $\frac{x+5}{(x^2+1)^2(x-3)}$

Q.14 In $\triangle ABC$, $\overline{PQ} \parallel \overline{BC}$. Find x if $m\overline{AP} = 5x - 3$, $m\overline{BP} = 2$, $m\overline{PB} = 2$, $m\overline{AQ} = 2x + 1$ and $m\overline{QC} = 3$.

Q.15 Ratio of corresponding sides of two similar triangle is $2 : x : x - 5$ and the ratio of their areas is $1 : 9$. Find the value of x .

Q.16 Show that one and only one circle can pass through the vertices of a square.

Q.17 Show that the diameters of a circle bisect each other.

PHYSICS (New course)

Section-A (MCQ's)

Q.1 Choose the correct answer from the following choices:

- (i) A large ripple tank with a vibrator working at a frequency of 30 Hz produces 25 complete waves in a distance of 50 cm. The velocity of the wave is -1
(a) 53 cm s (b) 60 cm s-1 (c) 750 cm s (d) 1500 cm s
- (ii) Which of the following characteristics of a wave is independent of the others?
(a) speed (b) frequency (c) amplitude (d) wavelength
- (iii) The relation between v , f and λ of a wave is
(a) $v f = \lambda$ (b) $f \lambda = v$ (c) $v \lambda = f$ (d) $v = \lambda / f$
- (iv) Image formed by a camera is
(a) real, inverted, and diminished (b) virtual, upright and diminished
(c) virtual, upright and magnified (d) real, inverted and magnified
- (v) If a ray of light in glass is incident on an air surface at an angle greater than the critical angle, the ray will
(a) refract only (b) reflect only
(c) partially refract and partially reflect (d) diffract only
- (vi) A positive and a negative charge are initially 4 cm apart. When they are moved closer together so that they are now only 1 cm apart, the force between them is
(a) 4 times smaller than before (b) 4 times larger than before
(c) 8 times larger than before (d) 16 times larger than before
- (vii) Five joules of work is needed to shift 10 C of charge from one place to another. The potential difference between the places is
(a) 0.5 V (b) 2 V (c) 5 V (d) 10 V

(ix) Two small charged spheres are separated by 2 mm. Which of the following would produce the greatest attractive force?

- (a) $+1q$ and $+4q$ (b) $-1q$ and $-4q$ (c) $+2q$ and $+2q$ (d) $+2q$ and $-2q$

(x) What happens to the intensity or the brightness of the lamps connected in series as more and more lamps are added?

- (a) increases (b) decreases (c) remains the same
(d) cannot be predicted

(xi) Why should household appliances be connected in parallel with the voltage source?

- (a) to increase the resistance of the circuit
- (b) to decrease the resistance of the circuit
- (c) to provide each appliance the same voltage as the power source
- (d) to provide each appliance the same current as the power source

(xii) The step-up transformer

- (a) increases the input current
(b) increases the input voltage
(c) has more turns in the primary
(d) has less turns in the secondary coil

(xiii) The turn ratios of a transformer is 10. It means

- (a) $I_s = 10 I_p$ (b) $N_s I_p = N I_{10}$ (c) $N_s = 10 N_p$ (d) $V_s I_p = V/10$

(xiv) When Uranium (92 protons) ejects a beta particle, how many protons will be in the remaining nucleus?

- (a) 89 protons (b) 90 protons (c) 91 protons (d) 93 protons

- (xv) Which of the following is an example of simple harmonic motion?
(a) the motion of simple pendulum
(b) the motion of ceiling fan
(c) the spinning of the Earth on its axis
(d) a bouncing ball on a floor
- (xi). If the mass of the bob of a pendulum is increased by a factor of 3, the period of the pendulum's motion will
(a) be increased by a factor of 2 (b) remain the same
(c) be decreased by a factor of 2 (d) be decreased by a factor of 4
- (xii) Which of the following devices can be used to produce both transverse and longitudinal waves?
(a) a string (b) a ripple tank (c) a helical spring (slinky)
(d) a tuning fork
- (xiii) The loudness of a sound is most closely related to its
(a) frequency (b) period (c) wavelength (d) amplitude
- (xiv) For a normal person, audible frequency range for sound wave lies between
(a) 10 Hz and 10 kHz (b) 20 Hz and 20 kHz (c) 25 Hz and 25 kHz
(d) 30 Hz and 30 kHz
- (xv) An object is 14 cm in front of a convex mirror. The image is 5.8 cm behind the mirror. What is the focal length of the mirror?
(a) -4.1 cm (b) -8.2 cm (c) -9.9 cm (d) -20 cm
- (xvi) The index of refraction depends on
(a) the focal length (b) the speed of light
(c) the image distance (d) the object distance
- (xvii) Which type of image is formed by a concave lens on a screen?
(a) inverted and real (b) inverted and virtual
(c) upright and real (d) upright and virtual

Section-B
(Short Answer)

Note: Answer any TEN of the following questions.

Q.2: A wooden bar vibrating into the water surface in a ripple tank has a frequency of 12 Hz. The resulting wave has a wavelength of 3 cm. What is the speed of the wave?

Q.3: Does increasing the frequency of a wave also increase its wavelength?

Q.4: Why must the volume of a stereo in a room with wall-to-wall carpet be tuned higher than in a room with a wooden floor?

Q.5: Define refraction of light.

Q.6: What is meant by the term total internal reflection?

Q.7: How can you show by simple experiments that there are two types of electric charges?

Q.8: What do we mean by the term e.m.f? Is it really a force? Explain.

Q.9: What is an electric motor?

Q.10: What are hazards of static electricity?

Q.11: A transformer is needed to convert a mains 240 V supply into a 12 V supply. If there are 2000 turns on the primary coil, then find the number of turns on the secondary

Q.12: Write the Note any one of the following:

(i) The Electro Gun

(ii) Nuclear Fusion

(iii) Simple Pendulum

Section-C

(Descriptive Answer)

Note: Answer any **THREE** of the following questions. marks.

Q.13 Waves are the means of energy transfer without transfer of matter. Justify this statement with the help of a simple experiment.

Q.14: (a) What nuclear reaction would release more energy, the fission reaction or the fusion reaction? Explain.

(b) Half-life of a radioactive element is 10 minutes. If the initial count rate is 368 counts per minute, find the time for which count rates reaches 23 counts per minute.

Q.15 (a) Explain Coulomb's law of electrostatics and write its mathematical form.

(b) If a high-voltage power line fell across your car while you were in the car, why should you not come out of the car?

Q.16 What is difference between D.C and A.C?

Q.17 Which device is used for converting electrical energy into mechanical energy?