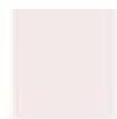




Physics by fiziks

Learn Physics in Right Way



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CUET(PG) Geophysics

Question Paper -2026

Learn Physics in Right Way

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Q1. Two projectiles are subject to the same acceleration. Motion of one projectile as seen from another projectile will always be a:

- (a) Parabola (b) Circle
(c) Straight line (d) Hyperbola

Ans.: (c)

Q2. In parallel resonance circuit, the current:

- (a) leads the emf by a phase angle of $\frac{\pi}{2}$ (b) lags the emf by a phase angle of $\frac{\pi}{4}$
(c) leads or lags the emf by a phase angle of π (d) leads or lags the emf by a phase angle of $\frac{\pi}{2}$

Ans.: (c)

Q3. The velocity of sound in a gas in which waves of wavelength $1m$ and $1.01m$ produces 10 beats per second is:

- (a) 505 m/s (b) 100 m/s
(c) 1010 m/s (d) 101 m/s

Ans.: (c)

Q4. A rocket motor consumes $3000kg$ of fuel per minute exhausting it with a speed of $5 \times 10^3 m/s$. The magnitude of force exerted on rocket is:

- (a) $5 \times 10^5 N$ (b) $3 \times 10^6 N$
(c) $6 \times 10^3 N$ (d) $25 \times 10^4 N$

Ans.: (d)

Q5. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The Laws of Physics, all take the same identical form for all frames of reference in uniform relative motion (for all inertial frame of references)

Reason (R): This is due to absence of an absolute or fixed frame of reference.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
(c) (A) is correct but (R) is not correct
(d) (A) is not correct but (R) is correct

Ans.: (a)

Q6. Calculate the effective weight of astronaut of ordinarily weighing ' w ' kg, when his rocket moves with acceleration ' a ' m/s^2 in the following cases.

- (A) $w = 60\text{ kg}$, $a = 5g$ upwards
- (B) $w = 60\text{ kg}$, $a = 8g$ upwards
- (C) $w = 50\text{ kg}$, $a = 6g$ upwards
- (D) $w = 60\text{ kg}$, $a = 10g$ upwards

Choose the **correct** answer from the options given below:

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

Ans.: (a)

Q7. Which of the following is true in a series LCR circuit, at $X_L = X_C$ (Inductive Impedance = Capacitive Impedance)?

- (A) Total Impedance is equal to resistance (R)
- (B) Current in circuit is in phase with applied emf
- (C) Current in circuit leads the emf by $\frac{\pi}{2}$
- (D) Current in circuit lags the emf by $\frac{\pi}{2}$
- (E) Current may lead or lag the emf by $\frac{\pi}{4}$

Choose the **correct** answer from the options given below:

- (a) A, B only
- (b) A, B, D only
- (c) A, C, E only
- (d) A, D only

Ans.: (a)

Q8. Which of following is invariant under Galilean Transformation?

- (A) Velocity
- (B) Linear Momentum
- (C) Acceleration
- (D) Length
- (E) Force

Choose the **correct** answer from the options given below:

- (a) C, D, E only
- (b) A, B, C, D only
- (c) A, C, D, E only
- (d) A, B, C only

Ans.: (a)

Q9. Match List-I with List-II.

List-I	List-II
(A) M.I. of solid cone about its vertical axis	(I) $\frac{1}{4}M(R^2 + r^2)$
(B) M.I. of solid cylinder about its own axis	(II) $\frac{1}{4}MR^2$
(C) M.I. of circular lamina about a diameter	(III) $\frac{1}{2}MR^2$
(D) M.I. of an angular ring of inner radius is 'r' Outer is R about a diameter	(IV) $\frac{3}{10}MR^2$

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-III, D-IV (b) A-IV, B-III, C-II, D-I
(c) A-II, B-I, C-III, D-IV (d) A-IV, B-II, C-III, D-I

Ans.: (b)

Q10. Match List-I with List-II.

List-I	List-II
(A) Torque	(I) Rejactor Circuit
(B) Force	(II) Rotational Motion
(C) Rocket	(III) Linear Motion
(D) Parallel LCR Circuit	(IV) Variable Mass

Choose the **correct** answer from the options given below:

- (a) A-II, B-III, C-IV, D-I (b) A-III, B-IV, C-I, D-II
(c) A-I, B-II, C-III, D-IV (d) A-II, B-IV, C-I, D-III

Ans.: (a)

Q11. Poynting Vector:

(a) points in the direction of electric field

(b) is given by $\frac{1}{\mu_0} (\vec{E} \times \vec{B})$

(c) is force-energy theorem of electrodynamics

(d) is work-energy theorem of electrodynamics and is given by $\frac{1}{\mu_0} (\vec{E} \times \vec{B})$

Ans.: (d)

Q12. Which of the following represent **correct** form of displacement current?

(a) $\frac{1}{2} \epsilon_0 E^2$

(b) $\frac{1}{2} \frac{B^2}{\mu_0}$

(c) $\vec{E} \times \vec{B}$

(d) $\epsilon_0 \frac{\partial \vec{E}}{\partial t}$

Ans.: (d)

Q13. The common emitter configuration of transistor gives:

- (a) high voltage gain and high current gain
- (b) unit voltage gain and high current gain
- (c) high voltage gain and unit current gain
- (d) unit voltage gain and unit current gain

Ans.: (a)

Q14. A Negative feedback:

- (a) improves frequency response and nonlinearity of operation of the amplifier
- (b) increase the noise level of output
- (c) increases the transfer gain of a transistor
- (d) all of these

Ans.: (a)

Q15. Two long coaxial metal cylinders (inner radius ' r_1 ' and outer radius ' r_2 ') are separated by material of conductivity ' k '. If cylinders are kept at a potential difference of ' V ' the current flows from one to the other in length ' l ' is:

(a) $\frac{2\pi kl}{\log_e \left(\frac{r_2}{r_1} \right)} V$

(b) $\frac{2\pi kV}{\log_e \left(\frac{r_2}{r_1} \right)}$

(c) $\frac{2\pi klV}{r_2}$

(d) $\frac{2\pi klV}{r_1}$

Ans.: (a)

Q16. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): FETs are in general more suitable than BJTs particularly at low frequencies.

Reason (R): The reason of more suitability of FETs than BJTs at low frequencies is their high input resistance and high power gain.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 (b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (c) (A) is correct but (R) is not correct
 (d) (A) is not correct but (R) is correct

Ans.: (a)

Q17. Calculate Ripple factor in the following at 50 Hz

- (A) π section filter having $C_1 = 200\mu F$, $C_2 = 100\mu F$, $L_1 = 50mH$, $R_L = 100\Omega$
 (B) π section filter having $C_1 = 200\mu F$, $C_2 = 200\mu F$, $L_1 = 50mH$, $R_L = 100\Omega$
 (C) π section filter having $C_1 = 200\mu F$, $C_2 = 200\mu F$, $L_1 = 100mH$, $R_L = 100\Omega$
 (D) π section filter having $C_1 = 100\mu F$, $C_2 = 400\mu F$, $L_1 = 100mH$, $R_L = 200\Omega$

Choose the **correct** answer from the options given below:

- (a) $A > B > C > D$ (b) $D > C > B > A$
 (c) $A < B > C > D$ (d) $C > D > B > A$

Ans.: (a)

Q18. Which of the following are correct form of Maxwell's equation?

- (A) $\vec{\nabla} \cdot \vec{B} = 0$ (B) $\vec{\nabla} \cdot \vec{E} = \frac{\rho}{\epsilon_0}$
 (C) $\vec{\nabla} \times \vec{E} = -\frac{\partial \vec{B}}{\partial t}$ (D) $\frac{1}{2} \left(\epsilon_0 E^2 + \frac{B^2}{\mu_0} \right) = U$

Choose the **correct** answer from the options given below:

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

Ans.: (a)

Q19. Match List-I with List-II.

List-I	List-II
(A) Avalanche Breakdown	(I) GaAsP
(B) Zener Breakdown	(II) Microwave Applications
(C) Point Contact diode	(III) Dominant in heavily doped regions
(D) LED Diode	(IV) Very lightly doped regions

Choose the **correct** answer from the options given below:

- (a) A-IV, B-III, C-II, D-I (b) A-I, B-II, C-III, D-IV
 (c) A-II, B-I, C-IV, D-III (d) A-II, B-I, C-III, D-IV

Ans.: (a)

Q20. The direction in a uniaxial crystal along which the e-ray and o-ray travel with same speed is:

- (a) Brewster angle (b) Optic axis
(c) Plane of polarization (d) Angle of polarization

Ans.: (b)

Q21. For a wave train of wavelength ' λ ' having ' N ' number of wave oscillations, the coherence length is:

- (a) $\frac{\lambda}{N}$ (b) $N\lambda$ (c) $\lambda^2 N$ (d) $\frac{N}{\lambda}$

Ans.: (b)

Q22. In a Michelson interferometer, 100 fringes cross the field of view when the movable mirror is moved through $29.48 \mu\text{m}$. The wavelength of light used is:

- (a) $5896 \text{\AA}$ (b) 5896 nm (c) 5896 mm (d) $2948 \text{\AA}$

Ans.: (a)

Q23. Newton's Ring:

- (a) are examples of fringes of unequal thickness
(b) are formed when a plano-convex lens of a large radius of curvature placed on a plane glass is illuminated with monochromatic light
(c) are parabolic fringes
(d) are formed due to the phenomenon of diffraction

Ans.: (b)

Q24. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): The Fraunhofer diffraction is produced by the interference between parallel rays. The Fraunhofer diffraction can be observed using two convex lens.

Reason (R): The two convex lens are used to observe Fraunhofer diffraction one to make light from the source parallel and other to focus the light after diffraction on to the screen.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)
(c) (A) is correct but (R) is not correct
(d) (A) is not correct but (R) is correct

Ans.: (a)

Q25. In Newton's Ring experiment with reflected light, the correct vertically downward arrangement of equipments is:

- (A) Microscope, Glass plate at 45° , Planoconvex lens, Plane Glass plate
- (B) Planoconvex lens, Microscope, Plane Glass plate
- (C) Glass plate at 60° , Microscope, Planoconvex lens
- (D) Microscope, Plane Glass plate, Planoconvex lens

Choose the **correct** answer from the options given below:

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

Ans.: (a)

Q26. Which of the following holds for coherence of light?

- (A) Coherence is mainly divided into temporal and spatial coherence
- (B) Temporal coherence is directly related to finite bandwidth of source
- (C) Spatial coherence is related to finite size of the source
- (D) Spatial coherence is related to finite bandwidth of the source

Choose the **correct** answer from the options given below:

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

Ans.: (b)

Q27. Match List-I with List-II.

List-I	List-II
(A) Optical Pumping	(I) Four Level Laser
(B) He-Ne Laser	(II) Population Inversion
(C) Ruby Laser	(III) Three Level Laser
(D) Optical Resonator	(IV) Pair of optically plane parallel Mirrors

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-III, D-IV
- (b) A-II, B-I, C-III, D-IV
- (c) A-I, B-II, C-IV, D-III
- (d) A-IV, B-III, C-II, D-I

Ans.: (b)

Q28. Which of the following is reversible process?

- (a) Production of heat by friction
- (b) Joule Thomson effect
- (c) Production of heat by passage of current through a resistance
- (d) Slow expansion / compression of a gas at constant temperature

Ans.: (d)

Q29. One mole of an ideal gas expands isothermally to ten times its initial volume. The change in entropy in terms of ' R ' (Gas constant) is:

(a) $1.387 \frac{R \text{ cal}}{J \text{ K}}$

(b) $2.303 \frac{R \text{ cal}}{J \text{ K}}$

(c) $1.447 \frac{R \text{ cal}}{J \text{ K}}$

(d) $23.03 \frac{R \text{ cal}}{J \text{ K}}$

Ans.: (b)

Q30. Which of following is incorrect thermodynamical relation of Maxwell?

(a) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

(b) $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$

(c) $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$

(d) $\left(\frac{\partial P}{\partial T}\right)_V = \left(\frac{\partial V}{\partial S}\right)_P$

Ans.: (d)

Q31. An iron furnace radiates 42.5 calories per second through an opening of cross section 1 square centimetre (1 cm^2). If the relative emittance of the furnace is 0.80. The temperature of furnace is:

(Given Stefan's constant (σ) = $1.36 \times 10^{-8} \text{ cal/m}^2 \text{ s K}^4$)

(a) 2500 K

(b) 273 K

(c) 373 K

(d) 500 K

Ans.: (a)

Q32. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): In photo-electric effect there is no time lag ($\sim 10^{-9} \text{ s}$) between incidence of photon and emission of photoelectrons.

Reason (R): This is because electro-magnetic wave energy is concentrated in photons and not spread out, so there should be no delay in the emission of electrons.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(c) (A) is correct but (R) is not correct

(d) (A) is not correct but (R) is correct

Ans.: (a)

Q33. Calculate the entropy change in the following? (Given that Latent Heat of steam is 540 cal/g, latent heat of Ice is 80 cal/g)

- (A) 10g of water at 100°C converted to steam at same temperature
- (B) 20g of water at 100°C converted to steam at same temperature
- (C) 1g of ice at 0°C is converted into water at 0°C
- (D) 10g of ice at 0°C is converted into water at 0°C

Choose the **correct** answer from the options given below:

- (a) $B > A > D > C$
- (b) $A > B > C > D$
- (c) $A < B < C < D$
- (d) $A > B < C > D$

Ans.: (a)

Q34. Which of following is / are **correct** Tds equation:

- (A) $Tds = T \left(\frac{\partial S}{\partial T} \right)_V dT + T \left(\frac{\partial S}{\partial V} \right)_T dV$
- (B) $Tds = C_V dT + T \left(\frac{\partial P}{\partial T} \right)_V dV$
- (C) $Tds = C_P dT - T \left(\frac{\partial V}{\partial T} \right)_P dp$
- (D) $Tds = C_V dT - T \left(\frac{\partial V}{\partial T} \right)_P dP$

Choose the **correct** answer from the options given below:

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

Ans.: (b)

Q35. Which of the following is correct in Compton effect?

- (A) X-ray photon strikes an electron which is at rest
- (B) Maximum Compton shift is few metres
- (C) Maximum Compton shift is $0.0484\text{\AA}$
- (D) an electron strikes on metal surface

Choose the **correct** answer from the options given below:

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

Ans.: (d)

Q36. Match List-I with List-II.

List-I	List-II
(A) Maxwell Thermodynamic Relation	(I) $G = U - TS + PV$
(B) Clausius Clapeyronis Equation	(II) $H = U + PV$
(C) Enthalpy	(III) $\frac{\partial P}{\partial T} = \frac{L}{T(V_2 - V_1)}$
(D) Gibb's function	(IV) $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-III, D-IV (b) A-IV, B-III, C-II, D-I
(c) A-III, B-IV, C-I, D-II (d) A-I, B-II, C-IV, D-III

Ans.: (b)

Q37. Match List-I with List-II.

List-I	List-II
(A) Michelson Morley Exp.	(I) Inelastic scattering of light by medium
(B) Raman effect	(II) Stefan's or Wien's displacement law
(C) Planck Radiation Law	(III) Resonators exchange energy in Quanta
(D) Estimation of Temperature of Sun	(IV) To detect ether and earth velocity relative to ether

Choose the **correct** answer from the options given below:

- (a) A-IV, B-I, C-III, D-II (b) A-I, B-II, C-III, D-IV
(c) A-IV, B-III, C-II, D-I (d) A-I, B-IV, C-II, D-III

Ans.: (a)

Q38. Consider the following differential equations which are obtained by successive differentiations:

- (A) If $y = e^{a \sin^{-1} x}$, then $(1-x^2)y_{n+2} - (2n-1)y_{n+1} - (n^2+a^2)y_n = 0$
(B) If $y = e^{a \sin^{-1} x}$, then $(1-x^2)y_{n+2} - (2n+1)xy_{n+1} - (n^2+a^2)y_n = 0$
(C) If $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + a^2y = 0$, then $(1-x^2)^2 y_{n+2} - (2n+1)y_{n+1} - (n^2-a^2)y_n = 0$
(D) If $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + a^2y = 0$, then $(1-x^2)^2 y_{n+2} + (2n+1)y_{n+1} + (n^2+a^2)y_n = 0$

Choose the **correct** answer from the options given below:

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

Ans.: (a)

Q39. The volume of the solid of revolution of the cardioid $r = a(1 + \cos \theta)$ about the initial line is:

- (a) πa^2 (b) πa^3
(c) $\frac{8}{3}\pi a^2$ (d) $\frac{8}{3}\pi a^3$

Ans.: (d)

Q40. Evaluate $\iint_S \vec{A} \cdot \vec{n} ds$, where $\vec{A} = 2xy\hat{i} + yz^2\hat{j} + xz\hat{k}$ and S is the surface of the region bounded by $x = 0$, $y = 0$, $z = 0$, $y = 3$ and $x + 2z = 6$.

- (a) $\frac{351}{2}$ (b) 351
(c) $\frac{351}{4}$ (d) $\frac{351}{5}$

Ans.: (a)

Q41. Which motion is simple harmonic motion?

- (a) $y = ae^{\omega t}$ (b) $y = 3t^2 + at$
(c) $y = 4t^3 + 2t^2 + at$ (d) $y = a \cos \omega t + b \sin \omega t$

Ans.: (d)

Q42. Which of the following quantity is **not** conserved in inelastic collision?

- (a) Linear momentum
(b) Kinetic energy
(c) Total energy
(d) Linear momentum and total energy both

Ans.: (b)

Q43. Determine the constant b such that $\vec{A} = (bx + 4y^2z)\hat{i} + (x^3 \sin z - 3y)\hat{j} - (e^x + 4 \cos x^2y)\hat{k}$ is solenoidal:

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

Ans.: (b)

Q44. The equation of line passing through $(-3, 5)$ and perpendicular to the line through the points $(2, 5)$ and $(-3, 6)$ is:

- (a) $5x + y - 20 = 0$ (b) $5x - y + 20 = 0$
(c) $5x - 2y + 40 = 0$ (d) $5x + 2y - 40 = 0$

Ans.: (b)

Q45. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): If a function $f(x)$ is continuous in $[a, b]$ and differentiable in (a, b) , then there exists a point $c \in (a, b)$ such that $\frac{f(b) - f(a)}{b - a} = f'(c)$

Reason (R): This is the statement of Cauchy's mean value theorem.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (b) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)
- (c) (A) is correct but (R) is not correct
- (d) (A) is not correct but (R) is correct

Ans.: (c)

Q46. Which of the following are indeterminate form?

- (A) 0^0 (B) 1^∞ (C) ∞^0 (D) $0 \times \infty$ (E) 1.00

Choose the **correct** answer from the options given below:

- (a) A and E only
- (b) A, B, C only
- (c) A, B, C, E only
- (d) A, B, C, D only

Ans.: (d)

Q47. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): Lyapunov direct method states that the equilibrium point of a system is asymptotically stable if there exists a positive definite function whose derivative is negative definite.

Reason (R): The equilibrium point of $\frac{dx}{dt} = -y, \frac{dy}{dt} = x$ is asymptotically stable.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (b) Both (A) and (R) are correct but (R) is **not** the correct explanation of (A)
- (c) (A) is correct but (R) is not correct
- (d) (A) is not correct but (R) is correct

Ans.: (c)

Q48. Match List-I with List-II.

List-I	List-II
Property	Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
(A) Coordinate of centre	(I) $(a, 0)$
(B) One coordinate of vertex	(II) $(0, 0)$
(C) Equation of transverse axis	(III) $y = 0$
(D) Equation of conjugate axis	(IV) $x = 0$

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-III, D-IV (b) A-I, B-II, C-IV, D-III
(c) A-II, B-I, C-III, D-IV (d) A-II, B-I, C-IV, D-III

Ans.: (c)

Q49. A non homogeneous system of linear equation, $Ax = B$ of n unknowns is called consistent if:

- (a) $\text{Rank}(A) = n$ (b) $\text{Rank}(A : B) = n$
(c) $\text{Rank}(A : B) = \text{Rank}(A) = 0$ (d) $\text{Rank}(A) < \text{Rank}(A : B)$

Ans.: (c)

Q50. Consider the following properties which are related to equations and their roots:

- (A) If $1, \alpha, \beta, \gamma$ are the roots of $x^4 - 1 = 0$, then $(1 - \alpha)(1 - \beta)(1 - \gamma) = 0$
(B) If $1, \alpha, \beta, \gamma$ are roots of $x^4 - 1 = 0$, then $(1 - \alpha)(1 - \beta)(1 - \gamma) = 4$
(C) If $\omega, \omega^2, \omega^3 \dots \omega^{n-1}$ are $n-1$, n^{th} complex roots of unity, then $(1 - \omega)(1 - \omega^2)(1 - \omega^3) \dots (1 - \omega^{n-1}) = n - 1$
(D) If $\omega, \omega^2, \omega^3 \dots \omega^{n-1}$ are $n-1$, n^{th} complex roots of unity, then $(1 - \omega)(1 - \omega^2)(1 - \omega^3) \dots (1 - \omega^{n-1}) = n$

Choose the **correct** answer from the options given below:

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

Ans.: (b)

Q51. The equation of right circular cylinder of radius 2 cm whose axis passes through the point $(1, 2, 3)$ and has direction cosines proportional to $(2, -3, 6)$ is:

- (a) $45x^2 + 40y^2 + 13z^2 + 36yz + 24zx + 12xy + 42x + 280y + 126z + 294 = 0$
 (b) $45x^2 + 40y^2 + 13z^2 + 36yz - 24zx + 12xy - 42x - 280y - 126z + 294 = 0$
 (c) $45x^2 + 40y^2 + 13z^2 + 36yz - 24zx - 12xy + 42x + 280y + 126z - 294 = 0$
 (d) $45x^2 - 40y^2 - 13z^2 + 36yz - 24zx - 12xy + 42x + 280y + 126z - 294 = 0$

Ans.: (b)

Q52. Match List-I with List-II.

List-I Type of matrix	List-II Property
(A) Orthogonal matrix	(I) Product of matrix and its transpose equals to identity matrix
(B) Skew-Hermitian matrix	(II) Diagonal elements are zero
(C) Real skew symmetric matrix	(III) Diagonal elements are real
(D) Hermitian matrix	(IV) Diagonal elements are either zero or pure imaginary

Choose the **correct** answer from the options given below:

- (a) A-II, B-I, C-III, D-IV
 (b) A-II, B-III, C-I, D-IV
 (c) A-III, B-I, C-II, D-IV
 (d) A-I, B-IV, C-II, D-III

Ans.: (d)

Q53. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): $(\cos \theta + i \sin \theta)^{p/q}$ has q and only q different roots, q being a positive integer.

Reason (R): $(-1)^{1/3}$ has three different roots.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
 (b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
 (c) (A) is correct but (R) is not correct
 (d) (A) is not correct but (R) is correct

Ans.: (a)

Q54. For the asymptotes of an algebraic equation of degree n , the $\phi_n(m)$ can be obtained by:

- (A) Putting $x = m, y = 1$ in the highest degree term of equation
- (B) Putting $x = 1, y = m$ in the highest degree term of equation
- (C) Putting $x = m, y = 1$ in the lowest degree term of equation
- (D) Putting $x = 1, y = m$ in the lowest degree term of equation

Choose the **correct** answer from the options given below:

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

Ans.: (b)

Q55. The asymptotes parallel to x -axis of the curve $y^3 + x^2y + 2xy^2 - y + 1 = 0$ is

- (a) $y = 1$
- (b) $y = 2$
- (c) $y = 0$
- (d) $y = -1$

Ans.: (c)

Q56. The reduction formula for $\int e^{ax} \cos bx \, dx$ is:

- (a) $\frac{1}{a^2 + b^2} e^{ax} (a \sin bx - b \cos bx)$
- (b) $\frac{1}{a^2 + b^2} e^{ax} (a \sin bx + b \cos bx)$
- (c) $\frac{1}{\sqrt{a^2 + b^2}} e^{ax} \cos \left(bx - \tan^{-1} \frac{b}{a} \right)$
- (d) $\frac{1}{\sqrt{a^2 + b^2}} e^{ax} \sin \left(bx - \tan^{-1} \frac{b}{a} \right)$

Ans.: (c)

Q57. Consider the following statements related to slopes and angles of lines:

(A) The equation of a line which passes through the point (x_1, y_1) and has the slope m is $y - y_1 = m(x - x_1)$

(B) The angle θ between the lines having slopes m_1 and m_2 is given by $\tan \theta = \pm \frac{m_2 - m_1}{1 + m_1 m_2}$

(C) The acute angle θ between two lines $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is given by

$$\tan \theta = \left| \frac{a_2 b_1 - a_1 b_2}{a_1 a_2 + b_1 b_2} \right|$$

(D) The equation of the line passing through two points (x_1, y_1) and (x_2, y_2) is

$$y - y_1 = \left| \frac{y_2 - y_1}{x_2 - x_1} \right| (x - x_1)$$

Choose the **correct** answer from the options given below:

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

Ans.: (c)

Q58. Match List-I with List-II.

List-I	List-II
(A) $\nabla \times \vec{r}$	(I) Vector quantity
(B) $\text{Div}(2x^2z\hat{i} - xy^2z\hat{j} + 3yz^2\hat{k})$ at point (1,1,1)	(II) 0
(C) Curl of a vector is a	(III) Scalar quantity
(D) Divergence of a vector is a	(IV) 8

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-IV, D-III (b) A-II, B-III, C-I, D-IV
(c) A-IV, B-I, C-III, D-II (d) A-II, B-IV, C-I, D-III

Ans.: (d)

Q59. When a man jumps out of a boat, the boat moves backward because of:

- (a) Conservation of energy
(b) Conservation of momentum
(c) Newton's third law
(d) Both Conservation of momentum and Newton's third law

Ans.: (d)

Q60. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): If a curve cuts every member of a given family of curves at right angle, it is called orthogonal trajectory.

Reason (R): For the orthogonal trajectory of a differential equation, the derivative $\frac{dy}{dx}$ is replaced by $-\frac{dx}{dy}$.

In the light of the above statements, choose the **most appropriate answer** from the options given below:

- (a) Both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) Both (A) and (R) are correct but (R) is not the correct explanation
(c) (A) is correct but (R) is not correct
(d) (A) is not correct but (R) is correct

Ans.: (a)

Q61. A linear differential equation with constant coefficients

$$a_0 \frac{d^n y}{dx^n} + a_1 \frac{d^{n-1} y}{dx^{n-1}} + a_2 \frac{d^{n-2} y}{dx^{n-2}} + \dots + a_n y = F(x) \text{ is non-homogeneous, if:}$$

- (a) $F(x) = 0$
- (b) $F(x) \neq 0$
- (c) degree and order are equal
- (d) order is always greater than its degree

Ans.: (b)

Q62. Match List-I with List-II.

List-I	List-II
(A) Node	(I) Stable
(B) Center	(II) Unstable
(C) Saddle point	(III) Asymptotic stable
(D) Spiral, when eigen values are complex with negative real parts	(IV) Asymptotic stable or unstable

Choose the **correct** answer from the options given below:

- (a) A-IV, B-I, C-II, D-III
- (b) A-III, B-I, C-II, D-IV
- (c) A-II, B-III, C-IV, D-I
- (d) A-IV, B-II, C-I, D-III

Ans.: (a)

Q63. The integral equation

$$y(x) = x + \int_2^3 \cos(x-t) y(t) dt \text{ is a:}$$

- (a) Volterra integral equation of first kind
- (b) Singular integral equation
- (c) Fredholm integral equation
- (d) Volterra integral equation of second kind

Ans.: (c)

Q64. The orthogonal trajectories of the cardioids $r = a(1 - \cos \theta)$ is:

- (a) $r = a(1 + \sin \theta)$
- (b) $r = a(1 - \sin \theta)$
- (c) $r = a(1 + \cos \theta)$
- (d) $r = a \cos \theta$

Ans.: (c)

Q65. Following are the parts of general solution of $\frac{d^2 y}{dx^2} + 2\frac{dy}{dx} + y = x \cos x$:

(A) $(C_1 + C_2 x)e^{-x}$

(B) $(C_1 + C_2 x)e^x$

(C) $\frac{x}{2} \sin x + \frac{\cos x}{2} + \frac{\sin x}{2}$

(D) $\frac{x}{2} \sin x + \frac{\cos x}{2} - \frac{\sin x}{2}$

Choose the **correct** answer from the options given below:

(a) A, C

(b) A, D

(c) B, C

(d) B, D

Ans.: (b)

Q66. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A): If a polynomial $f(x)$ is divisible by $(x-a)^m$ and is also divisible by $(x-a)^{m+1}$, $(x-a)^{m+2}$, ..., then the element a is called root of a multiplicity m of the equation $f(x) = 0$.

Reason (R): $x = -1$ is the root of multiplicity 3 of the equation $x^4 + x^3 - 3x^2 - 5x - 2 = 0$

In the light of the above statements, choose the **most appropriate answer** from the options given below:

(a) Both (A) and (R) are correct and (R) is the correct explanation of (A)

(b) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

(c) (A) is correct but (R) is not correct

(d) (A) is not correct but (R) is correct

Ans.: (d)

Q67. If the roots of the equation $x^3 + 3px^2 + 3qx + r = 0$ are in geometric progression (G.P.) then:

(a) $p^3 r + q^3 = 0$

(b) $p^3 r - q^3 = 0$

(c) $p^3 + r q^3 = 0$

(d) $p^3 - r q^3 = 0$

Ans.: (b)

Q68. Expansion of following functions are given below:

(A) $\sin x = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$

(B) $\cos x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$

(C) $\sin x = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$

(D) $\cos x = x - \frac{x^3}{3!} + \frac{x^5}{5!} + \dots$

Choose the **correct** answer from the options given below:

(a) A, D

(b) B, C

(c) A, C

(d) A, B

Ans.: (d)

Q69. Two forces of magnitude 8N and 6N act at a point making an angle of 90° between them, then magnitude of resultant force is:

- (a) 10 N (b) 12 N
(c) 13 N (d) 9 N

Ans.: (a)

Q70. $(1+i\sqrt{3})^{10} + (1-i\sqrt{3})^{10}$ equals to:

- (a) 1024 (b) - 1024
(c) - 624 (d) 624

Ans.: (b)

Q71. The function of two variables is maximum if:

- (A) $rt - s^2 > 0$
(B) $r < 0$
(C) $rt - s^2 < 0$
(D) $r > 0$
(E) $rt - s^2 = 0, r < 0$

Choose the **correct** answer from the options given below:

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

Ans.: (a)

Q72. Match List-I with List-II.

List-I Function	List-II n^{th} Derivative
(A) e^{ax}	(I) $r^n e^{ax} \cos(bx + c + n\phi)$, $r = (a^2 + b^2)^{1/2}$, $\phi = \tan^{-1}(b/a)$
(B) $\log(ax + b)$	(II) $a^n \cos\left(ax + b + \frac{n\pi}{2}\right)$
(C) $\cos(ax + b)$	(III) $a^n e^{ax}$
(D) $e^{ax} \cos(ax + b)$	(IV) $\frac{(-1)^{n-1} (n-1)! a^n}{(ax + b)^n}$

Choose the **correct** answer from the options given below:

- (a) A-III, B-IV, C-I, D-II (b) A-III, B-I, C-IV, D-II
(c) A-III, B-I, C-II, D-IV (d) A-III, B-IV, C-II, D-I

Ans.: (d)

Q73. Principle values of following logarithmic functions are gives below:

- (A) Principal value of $\log(-2) = \log 2 + i\pi$
 (B) Principal value of $\log(5i) = \log 5 + i\pi/2$
 (C) Principal value of $\log(\sqrt{3} - i) = \log 3 + i\frac{11\pi}{6}$
 (D) Principal value of $\log(2 - 3i) = \frac{1}{2}\log 13 - i\pi$

Choose the correct answer from the options given below:

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

Ans.: (a)

Q74. Consider the following statements related to a matrix:

- (A) Inverse of a matrix is unique if it exists (B) A matrix A is a non-singular if $|A| \neq 0$

- (C) Matrix $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ is orthogonal (D) Matrix $A = \begin{bmatrix} 0 & -2 & -8 \\ 2 & 0 & -4 \\ 8 & -4 & 0 \end{bmatrix}$ is skew symmetric

Choose the **correct** answer from the options given below:

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

Ans.: (c)

Q75. Match List-I with List-II.

List-I Function	List-II P.I. for $f(D)y = F(x)$
(A) $F(x) = e^{ax}$	(I) $\left[x - \frac{1}{f(D)} f'(D) \right] \frac{1}{f(a)} e^{ax}; f(a) \neq 0$
(B) $F(x) = \sin ax$	(II) $\frac{1}{D^2 \text{ is replaced by } (-a^2) \text{ if } f(D) \cos ax}$
(C) $F(x) = xe^{ax}$	(III) $\frac{1}{f(a)} e^{ax}; f(a) \neq 0$
(D) $F(x) = \cos ax$	(IV) $\frac{1}{D^2 \text{ is replaced by } (-a^2) \text{ in } f(D) \sin ax}$

Choose the **correct** answer from the options given below:

- (a) A-I, B-II, C-III, D-IV (b) A-III, B-IV, C-I, D-II
 (c) A-III, B-II, C-I, D-IV (d) A-I, B-IV, C-III, D-II

Ans.: (b)