

KEE – 2017 MODEL QUESTION PAPER

MATHEMATICS

(Common to all Candidates)

1. If I is the unit matrix of order n , Where $K \neq 0$ is a constant then $adj(KI) =$ _____

- a) $K^n(adjI)$ b) $K^{n-1}(adjI)$ c) $K^2(adjI)$ d) $K(adjI)$

2. The equation $\begin{vmatrix} 2x & 0 & 0 \\ x+2 & x+1 & 0 \\ x+3 & x+4 & x^2+1 \end{vmatrix} = 0$ has the solution

- a) $x = -1, -2, -3$ b) $x = 0, -1, \pm i$ c) $x = -2, -3, -4$ d) $x = 0, 0, 0$

3. If $\rho(A) = \rho(A, B)$ then the system is

- a) Consistent and has infinitely many solution
 b) Consistent and has unique solution
 c) Consistent
 d) Inconsistent

4. The value of $\begin{vmatrix} \cos \frac{\pi}{12} + i \sin \frac{\pi}{12} & 0 & 0 \\ 0 & \cos \frac{\pi}{6} + i \sin \frac{\pi}{6} & 0 \\ 0 & 0 & \cos \frac{\pi}{8} + i \sin \frac{\pi}{8} \end{vmatrix} =$ _____

- a) $\frac{-1-i}{\sqrt{2}}$ b) $\frac{1+i}{\sqrt{2}}$ c) $\frac{-1+i}{\sqrt{2}}$ d) $\frac{1-i}{\sqrt{2}}$

5. If A is square matrix then $A A' + A' A$ is a

- a) Unit Matrix b) Null Matrix c) Symmetric Matrix d) Skew Symmetric Matrix

6. If \vec{a} and \vec{b} are unit vectors having opposite directions, which one of the following is true?

- a) $\vec{a} \cdot \vec{b} = 1$ b) $\vec{a} \cdot \vec{b} = 0$ c) $\vec{a} \times \vec{b} = 0$ d) $|\vec{a}| |\vec{b}| = 2$

7. If \vec{a} and \vec{b} are two unit vectors and θ is the angle between them, then $(\vec{a} - \vec{b})$ is a unit vector if
- a) $\theta = \frac{\pi}{4}$ b) $\theta = \frac{\pi}{2}$ c) $\theta = \frac{\pi}{3}$ d) $\theta = \frac{2\pi}{3}$
8. The angle between the planes $x + y + z = 10$ and z axis is _____
- a) $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$ b) $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$ c) $\sin^{-1}(2)$ d) $\sin^{-1}(\sqrt{3})$
9. If \vec{a} is any vector, the value of $|\vec{a} \times \vec{i}|^2 + |\vec{a} \times \vec{j}|^2 + |\vec{a} \times \vec{k}|^2$ is _____
- a) a^2 b) $2a^2$ c) $3a^2$ d) 0
10. If $|z - z_1| = |z - z_2|$ then the locus of z is
- a) a circle with centre at the origin
 b) a circle with centre at z_1
 c) a straight line passing through the origin
 d) a perpendicular bisector of the line joining z_1 and z_2
11. If $\frac{1+x}{1-x} = \cos 2\theta + i \sin 2\theta$, then x is equal to
- a) $i \tan \theta$ b) $i \tan 2\theta$ c) $i \cot \theta$ d) $i \cot 2\theta$
12. Which of the following is incorrect?
- a) $|z_1 + z_2| \leq |z_1| + |z_2|$ b) $|z_1 + z_2| \geq |z_1| + |z_2|$
 c) $|z_1 - z_2| \leq |z_1| + |z_2|$ d) $|z_1 - z_2| \geq |z_1| - |z_2|$
13. If n is a positive integer than one and $a = \cos \frac{2\pi}{n} + i \sin \frac{2\pi}{n}$ then $1 + a + a^2 + \dots + a^{n-1} =$ _____
- a) 0 b) 1 c) -1 d) n
14. The point of contact of the tangent $y = mx + c$ and the parabola $y^2 = 4ax$ is
- a) $\left(\frac{a}{m^2}, \frac{2a}{m}\right)$ b) $\left(\frac{2a}{m^2}, \frac{a}{m}\right)$ c) $\left(\frac{a}{m}, \frac{2a}{m^2}\right)$ d) $\left(\frac{-a}{m^2}, \frac{-2a}{m}\right)$
15. The curve with parametric equation $x = 1 + 4 \cos \theta$, $y = 2 + 3 \sin \theta$ is _____
- a) a circle b) a parabola c) an ellipse d) a hyperbola

16. The intercept cut off by the plane $2x + y - z = 5$ with the axes is

- a) $\frac{2}{5}, \frac{1}{5}, \frac{-1}{5}$ b) $\frac{5}{2}, \frac{1}{5}, -5$ c) 2,1,-1 d) -2,-1,1

17. The condition that the line $lx + my + n = 0$ may be a normal to the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

- a) $al^3 + 2alm^2 + m^2n = 0$ b) $\frac{a^2}{l^2} + \frac{b^2}{m^2} = \frac{(a^2 + b^2)^2}{n^2}$
 c) $\frac{a^2}{l^2} + \frac{b^2}{m^2} = \frac{(a^2 - b^2)^2}{n^2}$ d) $\frac{a^2}{l^2} - \frac{b^2}{m^2} = \frac{(a^2 + b^2)^2}{n^2}$

18. The hyperbola with foci at (0,-1),(0,3) and one vertex at the origin is _____

- a) $3y^2 - x^2 - 6y = 0$ b) $3x^2 - y^2 + 6x = 0$
 c) $3x^2 - y^2 + 6y = 0$ d) $3x^2 - y^2 - 6x = 0$

19. $x = x_0$ is a root of even for the equation $f'(x) = 0$ then $x = x_0$ is a

- a) Maximum point b) Minimum point c) Inflexion point d) Critical point

20. The area of the largest rectangle that can be inscribed in the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is _____

- a) ab b) a^2b^2 c) $2ab$ d) $\sqrt{2}ab$

21. If the length of the diagonal of a square is increasing at the rate of 0.2m/sec, what is the rate of increase of its area when the side is $\frac{30}{\sqrt{2}}$ cm?

- a) $3 \text{ cm}^2/\text{sec}$ b) $6\sqrt{2} \text{ cm}^2/\text{sec}$ c) $3\sqrt{2} \text{ cm}^2/\text{sec}$ d) $6 \text{ cm}^2/\text{sec}$

22. In the law of mean, the value of ' θ ' satisfies the condition

- a) $\theta > 0$ b) $\theta < 0$ c) $\theta < 1$ d) $0 < \theta < 1$

23. If there is an error of 0.01 cm in the diameter of sphere when its radius is 5 cm, then the percentage error in its surface area is

- a) 0.1 % b) 0.2 % c) 0.02 % d) 2.0 %

24. In which region the curve $y^2(a + x) = x^2(3a - x)$

- a) $X > 0$ b) $x \leq -a$ and $x > 3a$ c) $-a < x < 3a$ d) $0 < x < 3a$

25. The curve $x^3 + y^3 = 3axy$ is symmetrical about _____.

- a) $x = 0$ b) $y = 0$ c) both axis d) $y = x$

26. $\int_0^a f(x)dx + \int_0^a f(2a - x)dx = \underline{\hspace{2cm}}$
 a) $\int_0^a f(x)dx$ b) $2 \int_0^a f(x)dx$ c) $\int_0^{2a} f(x)dx$ d) $\int_0^{2a} f(a - x)dx$
27. $\int_{-1}^0 |x + 1|dx$ is
 a) $\frac{-1}{2}$ b) $\frac{1}{2}$ c) 2 d) -2
28. The volume of the solid obtained when the area between the line joining the points (0,0) and (2, 3) and x-axis is rotated about x-axis is _____
 a) 2π b) 4π c) 8π d) 6π
29. The area between the parabolas $y^2 = 16x$ and the line $y = x$ is _____
 a) $\frac{442}{3}$ b) $\frac{441}{3}$ c) $\frac{128}{3}$ d) $\frac{256}{3}$
30. The differential equation formed by eliminating A and B from the relation $y = e^x(A \cos 3x + B \sin 3x)$ is
 a) $y'' - 2y' - 10y = 0$ b) $y'' - 2y' + 10y = 0$ c) $y'' + 2y' + 10y = 0$
 d) $y'' + 2y' - 10y = 0$
31. If $y = e^{-4x}(A \cos 3x + B \sin 3x)$ then
 a) $(D^2 - D - 12)y = 0$ b) $(D^2 + 8D + 25)y = \cos 3x + \sin 3x$
 c) $(D^2 + 8D + 25)y = 0$ d) $(D^2 - 8D + 25)y = e^{-4x}$
32. The differential equation satisfied by the all straight in xy plane is _____
 a) $\frac{dy}{dx} = a$ constant b) $\frac{d^2y}{dx^2} = 0$ c) $y + \frac{dy}{dx} = 0$ d) $\frac{d^2y}{dx^2} + y = 0$
33. The particular integral of $\frac{d^2y}{dx^2} + 9y = 1 + \sin 3x$ is _____
 a) $\frac{-x \cos 3x}{6} + \frac{1}{9}$ b) $\frac{x \sin 3x}{6}$ c) $\frac{-x \cos 3x}{6} + \frac{1}{10}$ d) $\frac{x \cos 3x}{6} + 9$
34. If $x \frac{dy}{dx} = y(\log y - \log x + 1)$ then the solution of the equation is
 a) $x \log \frac{y}{x} = cy$ b) $y \log \frac{x}{y} = cx$ c) $\log \frac{x}{y} = cy$ d) $\log \frac{y}{x} = cx$
35. The complementary function of differential equation $(D^2 - 1)y = \cos x$ is
 a) $Ae^x + Be^{-x}$ b) $Ae^{-x} + Be^{-x}$ c) $Ae^{2x} + Be^{-2x}$ d) $Ae^x + Be^x$
36. The particular integral of the differential equation $(D^3 + 1)y = x$ is
 a) x b) $-x$ c) $2x$ d) $\frac{x}{2}$

37. An element of order 2 in the group $(C - \{0\}, \bullet)$ is _____.
- a) $1-i$ b) $2+i$ c) $e^{i\pi}$ d) $\frac{2-i}{\sqrt{3}}$
38. The set $G = \{1, \omega, \omega^2\}$ of all the cube roots of unity forms an abelian group with respect to multiplication. Then the inverse of $\frac{1 + \omega + \omega^2 - \omega^7}{1 + \omega}$ is _____.
- a) $-(1 + \omega^2)$ b) $-(1 + \omega)$ c) ω d) $-\omega$
39. If a,b,c are any three elements of the group $(G, *)$ and $(a * b) * x = c$ then $x =$ _____.
- a) $c * (a^{-1} * b^{-1})$ b) $c * (b^{-1} * a^{-1})$ c) $(a^{-1} * b^{-1}) * c$
d) $(b^{-1} * a^{-1}) * c$
40. In congruence modulo 5, $x \in Z / x = 5k + 4, k \in z\}$ represents
- a) $[0]$ b) $[5]$ c) $[4]$ d) $[2]$
41. If $f(x) = k \sin \frac{\pi x}{5}, 0 \leq x \leq 5$ is a p.d.f. then the value of $k =$ _____.
- a) $\frac{2\pi}{5}$ b) $\frac{3\pi}{10}$ c) $\frac{\pi}{10}$ d) $\frac{\pi}{5}$
42. In a Poisson distribution if standard deviation is $\sqrt{2}$ then $P(X \geq 1)$ is _____.
- a) $1 - e^{-2}$ b) $1 + e$ c) $1 - e^2$ d) $1 - e^{-1}$
43. A die is thrown 100 times. If getting an odd number is success, then the variance of the number of success is _____.
- a) 50 b) 40 c) 25 d) 20
44. If 2 cards are drawn from a well shuffled pack of 52 cards, the probability that they are of the same colours with replacement is
- a) $\frac{1}{2}$ b) $\frac{25}{51}$ c) $\frac{26}{51}$ d) $\frac{25}{102}$
45. The binomial distribution have the mean
- a) n^2p b) np c) npq d) np^2

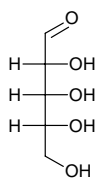
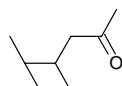
PHYSICS

1. Three small identical balls have charges $-3 \times 10^{-12} \text{ C}$, $8 \times 10^{-12} \text{ C}$ and $4 \times 10^{-12} \text{ C}$ respectively. They are brought in contact and then separated. Calculate the charge on each ball.
 - (a) $3 \times 10^{-12} \text{ C}$
 - (b) $0.3 \times 10^{-12} \text{ C}$
 - (c) $30 \times 10^{-12} \text{ C}$
 - (d) $0.03 \times 10^{-12} \text{ C}$
2. A dipole is placed in a uniform electric field with its axis parallel to the field. It experiences
 - (a) Only a net force
 - (b) Only a torque
 - (c) Both a net force and torque
 - (d) Neither a net force nor a torque
3. A charge of 60 C passes through an electric lamp in 2 minutes. Then the current in lamp is
 - (a) 30 A
 - (b) 1 A
 - (c) 0.5 A
 - (d) 5 A
4. Peltier coefficient at a junction of a thermocouple depends on
 - (a) The current in the thermocouple
 - (b) The time for which current flows
 - (c) The temperature of the junction
 - (d) The charge that passes through the thermocouple
5. A coil of area of cross section 0.5 m^2 with 10 turns is in a plane which is perpendicular to an uniform magnetic field of 0.2 Wb m^{-2} . The flux through the coil is
 - (a) 100 Wb
 - (b) 10 Wb
 - (c) 1 Wb
 - (d) Zero
6. The self inductance of a straight conductor is
 - (a) Zero
 - (b) Infinity

- (c) Very large
(d) Very small
7. If the wavelength of the light is reduced to one fourth, then the amount of scattering is
- (a) Increased by 16 times
(b) Decreased by 16 times
(c) Increased by 256 times
(d) Decreased by 256 times
8. The first excitation potential energy or the minimum energy required to excite the atom from ground state of hydrogen atom is
- (a) 13.6 eV
(b) 10.2 eV
(c) 3.4 eV
(d) 1.89 eV
9. X-ray is
- (a) Phenomenon of conversion of kinetic energy into radiation
(b) Conversion of momentum
(c) Conversion of energy into mass
(d) Principle of conservation of charge
10. Calculate the de Broglie wave length of an electron of kinetic energy 120 eV.
- (a) 11.21 Å
(b) 1.121 Å
(c) 112.1 Å
(d) 1121 Å
11. The nuclear radius of ${}^8_4\text{Be}$ nucleus is
- (a) 1.3 fm
(b) 2.6 fm
(c) 13 pm
(d) 26 pm
12. The explosion of atom bomb is based on the principle of
- (a) Uncontrolled fission reaction
(b) Controlled fission reaction
(c) Fusion reaction
(d) Thermonuclear reaction

13. Avalanche breakdown is primarily dependent on the phenomenon of
- (a) Collision
 - (b) Ionization
 - (c) Doping
 - (d) Recombination
14. According to the laws of Boolean algebra, the expression $(A+AB)$ is equal to
- (a) A
 - (b) B
 - (c) AB
 - (d) BA
15. In amplitude modulation, the band width is
- (a) Equal to the signal frequency
 - (b) Twice the signal frequency
 - (c) Thrice the signal frequency
 - (d) Four times the signal frequency

CHEMISTRY

- Sommerfield's theory suggests _____ orbits for atomic structure.
(a) Spherical (b) circular (c) elliptical (d) dumb-bell
- In filling u of electrons in orbitals, electrons will pair up only when all the available orbitals have at least one electron each. This is called _____.
(a) Afbau's principle (b) Pauli's exclusion principle (c) Hund's rule (d) Sommerfield's theory
- Octet rule is deviated in _____.
(a) XeF₄ (b) PCl₄ (c) PCl₅ (d) OsO₄
- The imperfect crystallization with a few atoms missed in the crystal lattice is called _____.
(a) Sckottky defect (b) Frenkel defect (c) Screw dislocation (d) Fresnel defect
- A sample of Strontium-90 is found to have decayed to one – eighth of its original amount after 87.3 years. What is the half life of Strontium-90?
(a) 40 years (b) 35.6 years (c) 29.1 years (d) 43.6 years
- The Arrhenius equation is _____.
(a) $k = A \cdot e^{RT/tQ}$ (b) $k = A \cdot e^{RT/Ea}$ (c) $k = A \cdot e^{Ea/RT}$ (d) $k = A \cdot e^{-Ea/RT}$
- The possible number of stereoisomers for the following compound is _____.

(a) 2 (b) 6 (c) 12 (d) 8
- The IUPAC name of the following compound is _____.

(a) 4,5-Dimethylhexan-2-one (b) 1,2-Dimethylhexan-4-one (c) 4,5-Dimethylpentan-2-one (d) 1,2-Dimethylpentan-3-one
- One of the following compound forms a Schiff's base. Identify the compound.
(a) Alcohol (b) ether (c) aldehyde (d) ester
- In Rosenmund reduction, the catalyst used is _____.
(a) Pd/Ba(NO₃)₂ (b) Pd/CuSO₄ (c) Ni/Pt (d) Pd/BaSO₄
- The carbonyl group can be converted into a -CH₂- group by _____ reduction.
(a) Catalytic (b) Clemmenson (c) Wolf-Kishner (d) Rosenmund

12. Carbylamine reaction is associated with ____.
- (a) Urea (b) aniline (c) benzophenone (d) benzaldehyde
13. Aromatic nitrocompounds are ____.
- (a) Yellow in color (b) blue in color (c) pleasant in smell (d) highly volatile
14. Addition of Conc. Sulphuric acid to glucose leads to ____.
- (a) gluconic acid (b) glutaric acid (c) charring of glucose (d) explosion
15. All the amino acids in the human body are ____.
- (a) D-amino acids (b) L-amino acids (c) DL-amino acids (d) deoxy amino acids

GENERAL APTITUDE**(for all candidates)**

1. Find the missing number in the series 54, 49, ____, 39, 34
a. 47 b. 44 c. 45 d. 46
2. SCD, TEF, UGH, ____, WKL
a. CMN b. UJI c. VIJ d. IJT
3. Here are some words translated from an artificial language
moolokarn means blue sky
wilkospadi means bicycle race
moolowilko means blue bicycle
Which word could mean “racecar”
a. wilkozwet b. spadiwilko c. haploch d. spadivolo

Find the necessary part of the underlined word.

4. HARVEST
a. autumn b. stockpile c. tractor d. crop

Find out the correct words for the following

5. ORDAIN
a. arrange b. command c. contribute d. establish
6. ADAGE
a. advice b. proverb c. enlargement d. advantage
7. BEHEST
a. behaviour b. hold down c. hold up d. relieve
8. Two bus tickets from city A to B and three tickets from city A to C cost ` . 77. But three tickets from city A to B and tow tickets from city A to C cost ` . 73. What are the fares for cities B and C from A?
a. Rs. 4, & Rs. 23 b. Rs. 13, & Rs. 17 c. Rs.15, & Rs. 14 d. Rs. 17, & Rs. 13
9. What least value must be assigned to * so that the number 197*5462 is divisible by 9?
a. 2 b. 4 c. 6 d. 8
10. As ‘wheel’ is related to ‘Vehicle’ similarly ‘clock’ is related to what?
a. Needle b. Nail c. Stick d. None of these
11. Blueberries cost more than strawberries
Blueberries cost less than raspberries
Raspberries cost more than both strawberries and blueberries
If the first tow statements are true, the third statement is

- a. True b. False c. Uncertain d. None
12. A, B, C, D, and E play a game of cards. A says to B, "If you give me three cards, you will have as many as E has and if I give you three cards, you will have as many as D has. "A and B together have 10 cards more than what D and E together have. If B has two cards more than what C has and the total number of cards be 133, how many cards does B have?
- a. 22 b. 23 c. 25 d. 35
13. King: Throne, Rider: ?
- a. Seat b. Horse c. Saddle d. Chair
14. Find the next letter of the following series J, F, M, A, M, J, J _____
- a. J b. A c. S d. O
15. Find the first number in the series:19, 23, 29, 31
- a. 12 b. 15 c. 16 d. 17