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**A**

**SET-X**

# PG-EE-2022

# SUBJECT : Mathematics Hons. (Five Year)

Sr. No. 10009

Time : 1¼ **Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)____________ (in words) ____________________

Name ____________________ Father's Name____________________

Mother's Name____________________ Date of Examination____________________

(Signature of the Candidate) (Signature of the Invigilator)

## CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail (coe@mdurohtak.ac.in) within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. If $\lambda$ is a non-real cube root of $-2$, then the value of $\begin{vmatrix} 1 & 2\lambda & 1 \\ \lambda^2 & 1 & 3\lambda^2 \\ 2 & 2\lambda & 1 \end{vmatrix}$ is equal to :

(1) $-10$ (2) $-13$

(3) $-11$ (4) $-12$

2. If $z = \begin{vmatrix} 3+2i & 5-i & 7-3i \\ i & 2i & -3i \\ 3-2i & 5+i & 7+3i \end{vmatrix}$, where $i = \sqrt{-1}$, then $z$ is :

(1) Purely Real (2) Purely Imaginary

(3) 1 (4) 0

3. The value of the determinant $\begin{vmatrix} 1 & e^{i\pi/3} & e^{i\pi/4} \\ e^{-i\pi/3} & 1 & e^{2i\pi/3} \\ e^{-i\pi/4} & e^{-2i\pi/3} & 1 \end{vmatrix}$, where $i = \sqrt{-1}$ is :

(1) $2 + \sqrt{2}$ (2) $2 - \sqrt{3}$

(3) $2 + \sqrt{3}$ (4) $-(2 + \sqrt{2})$

4. If $A$ is a skew-symmetric matrix, then trace of $A$ is :

(1) $-1$ (2) 1

(3) 0 (4) $i$

5. If $A = \begin{bmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(x)$, then $A^{-1}$ is equal to :

(1) $f(x)$ (2) $f(-x)$

(3) $-f(x)$ (4) 0

**6.** If $A^2 + A - I = 0$, then $A^{-1}$ is equal to :

(1) A–I
(2) A + I
(3) I
(4) 0

**7.** If $x^y \cdot y^x = 16$, then $\frac{dy}{dx}$ at (2, 2) is :

(1) 0
(2) 1
(3) –1
(4) $\frac{1}{2}$

**8.** If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx}$ is equal to :

(1) 1
(2) –1
(3) 0
(4) $\frac{1}{2}$

**9.** If $y = \tan^{-1}\left[\frac{\log_e(e/x^2)}{\log_e(ex^2)}\right] + \tan^{-1}\left[\frac{3+2\log_e x}{1-6\log_e x}\right]$, then $\frac{d^2y}{dx^2}$ is :

(1) –1
(2) 1
(3) $\infty$
(4) 0

**10.** The locus of all points on the curve $y^2 = 4a\left[x + a\sin\left(\frac{x}{a}\right)\right]$ at which the tangent is parallel to $x$-axis is :

(1) Ellipse
(2) Hyperbola
(3) Parabola
(4) Circle

**11.** Let $f(x)$ be a differential function for all $x$. If $f(1) = -2$ and $f'(x) \geq 2$ for all $x$ in $[1, 6]$, then minimum value of $f(6)$ is equal to :

(1) 4 (2) 6

(3) 2 (4) 8

**12.** The minimum value of $\left(1+\frac{1}{\sin^n \alpha}\right)\left(1+\frac{1}{\cos^n \alpha}\right)$ is equal to :

(1) 1 (2) $(1 + 2^{n/2})^2$

(3) $-1$ (4) $\frac{1+2^{n/2}}{1-2^{n/2}}$

**13.** If $\int f(x)\cos x \, dx = \frac{1}{2}\{f(x)\}^2 + c$, then $f(x)$ is given by :

(1) $\sin x + c$ (2) $\cos x + c$

(3) $x + c$ (4) $c$

**14.** $\int (x - {}^{11}c_1 x^2 + {}^{11}c_2 x^3 - {}^{11}c_3 x^4 + \text{............} - {}^{11}c_{11} x^{12})\, dx$ is equal to :

(1) $\frac{(1-x)^{13}}{13} - \frac{(1-x)^{12}}{12} + c$ (2) $\frac{(1-x)^{12}}{12} + \frac{(1-x)^{13}}{13} + c$

(3) $\frac{(1-x)^{13}}{12} + \frac{(1-x)^{12}}{13} + c$ (4) None of these

**15.** If $\int_0^1 \frac{e^t}{t+1} dt = a$, then $\int_{b-1}^{b} \frac{e^{-t}}{t-b-1} dt$ is equal to :

(1) $ae^{-b}$ (2) $ae^{b}$

(3) $-ae^{-b}$ (4) $-be^{-a}$

**16.** The value of $\int_0^2 [x^2 - x + 1]dx$ (where $[\cdot]$ denotes the greatest integer function) is given by :

(1) $\frac{7-\sqrt{5}}{2}$ (2) $\frac{8-\sqrt{5}}{2}$

(3) $\frac{6-\sqrt{5}}{2}$ (4) $\left(\frac{5-\sqrt{5}}{2}\right)$

**17.** The value of the integral $\int_{1/e}^{e} |\ln x|\, dx$ is :

(1) $1-\frac{1}{e}$ (2) $2\left(1-\frac{1}{e}\right)$

(3) $\frac{1}{e}-1$ (4) $(e-1)^{-1}$

**18.** The area bounded by $y = \frac{\sin x}{x}$, $x$ – axis and the ordinates $x = 0, x = \frac{\pi}{4}$ is :

(1) $= \frac{\pi}{4}$ (2) $> \frac{\pi}{4}$

(3) $< \frac{\pi}{4}$ (4) 0

**19.** The area between the curve $y = -x^2 + 2x^4$, the $x$-axis and the ordinates of two minima of the curve is :

(1) $\frac{7}{120}$ sq unit (2) $\frac{9}{120}$ sq unit

(3) $\frac{11}{120}$ sq unit (4) $\frac{13}{120}$ sq unit

**20.** The value of $f(0)$, so that the function $f(x)=\frac{1-\cos(1-\cos x)}{x^4}$ is continuous everywhere is :

(1) $\frac{1}{4}$ (2) $\frac{1}{8}$

(3) $\frac{1}{2}$ (4) None of these

**21.** The value of '$a$' for which $ax^2+\sin^{-1}(x^2-2x+2)+\cos^{-1}(x^2-2x+2)=0$ has a real solution, is :

(1) $\frac{2}{\pi}$ (2) $-\frac{2}{\pi}$

(3) $\frac{\pi}{2}$ (4) $-\frac{\pi}{2}$

**22.** If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then $xy+yz+zx$ is equal to :

(1) 0 (2) $-3$

(3) 3 (4) $-1$

**23.** The value of $\tan\left\{\left(\cos^{-1}\left(-\frac{2}{7}\right)-\frac{\pi}{2}\right)\right\}$ is :

(1) $\frac{2}{3\sqrt{5}}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{3}{\sqrt{5}}$ (4) $\frac{4}{\sqrt{5}}$

**24.** The least value of '$a$' for which $\frac{4}{\sin x}+\frac{1}{1-\sin x}=a$ has at least one solution in the interval $\left(0,\frac{\pi}{2}\right)$ is :

(1) 8 (2) 9

(3) 4 (4) 3

**25.** A spherical baloon is pumped at the rate of 10 inch$^3$/min. If radius of baloon is 15 inch, then the rate of increase of its radius is :

(1) $\frac{1}{30\pi}$ inch/min (2) $\frac{1}{120\pi}$ inch/min

(3) $\frac{1}{60\pi}$ inch/min (4) $\frac{1}{90\pi}$ inch/min

**26.** The order of the differential equation whose general solution is given by :
$y=(c_1+c_2)\cos(x+c_3)-c_4\cdot e^{x+c_5}$, where $c_1$, $c_2$, $c_3$, $c_4$ and $c_5$ are arbitrary constant, is :

(1) 5 (2) 4

(3) 3 (4) 2

**27.** The real value of $n$ for which the substitution $y=u^n$ will transform the differential equation $2x^4y\frac{dy}{dx}+y^4=4x^6$ into a homogeneous equation is :

(1) $\frac{3}{2}$ (2) $\frac{5}{2}$

(3) $\frac{1}{2}$ (4) 1

**28.** The differential equation representing the family of the curves $y^2 = 2c\,(x + \sqrt{c})$, where $c$ is a positive parameter, is of :

(1) order 2, degree 2 (2) order 1, degree 3

(3) order 3, degree 1 (4) None of these

**29.** The solution of the differential equation $\sin y \frac{dy}{dx} = \cos y(1 - x\cos y)$ is :

(1) $\sec y = x - 1 - ce^x$ (2) $\sec y = x + e^x + c$

(3) $\sec y = x - 1 + ce^x$ (4) $\sec y = x + 1 + ce^x$

**30.** $\int \frac{3 + 2\cos x}{(2 + 3\cos x)^2}\,dx$ is equal to :

(1) $\left(\frac{2\cos x}{2 + 3\sin x}\right) + c$ (2) $\left(\frac{2\cos x}{2 + 3\cos x}\right) + c$

(3) $\left(\frac{\sin x}{2 + 3\cos x}\right) + c$ (4) $\left(\frac{\sin x}{3 + 2\cos x}\right) + c$

**31.** If $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{a} + \vec{b}| = 5$, then $|\vec{a} - \vec{b}|$ is equal to :

(1) 5 (2) 4

(3) 2 (4) 1

**32.** If $(\vec{a} \times \vec{b})^2 + (\vec{a} \cdot \vec{b})^2 = 144$ and $|\vec{a}| = 4$, then $|\vec{b}|$ is equal to :

(1) 4 (2) 3

(3) 1 (4) 2

**33.** Let $|\vec{a}|=1, |\vec{b}|=2, |\vec{c}|=3$ and $\vec{a}\perp(\vec{b}+\vec{c}), \vec{b}\perp(\vec{c}+\vec{a}), \vec{c}\perp(\vec{a}+\vec{b})$. Then $|\vec{a}+\vec{b}+\vec{c}|$ is :

(1) $\sqrt{10}$
(2) $\sqrt{12}$
(3) $\sqrt{8}$
(4) $\sqrt{14}$

**34.** Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} \neq 0$ and $\vec{a}\times\vec{b} = 2\,\vec{a}\times\vec{c}, |\vec{a}|=|\vec{c}|=1, |\vec{b}|=4$ and $|\vec{b}\times\vec{c}|=\sqrt{15}$. If $\vec{b}-2\vec{c}=\lambda\vec{a}$, then $\lambda$ is equal to :

(1) 1
(2) 3
(3) $-4$
(4) 2

**35.** The point on the line $\frac{x-2}{1}=\frac{y+3}{-2}=\frac{z+5}{-2}$ at a distance of 6 from the point $(2, -3, -5)$ is :

(1) $(4, -7, -9)$
(2) $(4, 7, 9)$
(3) $(3, -5, -3)$
(4) $(-3, 5, 3)$

**36.** The coordinates of the centroid of the triangle ABC, where A, B, C are the points of intersection of the plane $6x + 3y - 2z = 18$ with the coordinate axes are :

(1) $(-1, 2, 3)$
(2) $(1, 2, -3)$
(3) $(-1, -2, -3)$
(4) $(1, -2, 3)$

**37.** The points $(8, -5, 6)$, $(11, 1, 8)$, $(9, 4, 2)$ and $(6, -2, 0)$ are the vertices of a :

(1) Rhombus
(2) Rectangle
(3) Parallelogram
(4) Square

**38.** The plane containing the two lines $\frac{x-3}{1}=\frac{y-2}{4}=\frac{z-1}{5}$ and $\frac{x-2}{1}=\frac{y+3}{-4}=\frac{z+1}{5}$ is $11x + my + nz = 28$, where :

(1) $m=-1, n=3$
(2) $m=-1, n=-3$
(3) $m=1, n=3$
(4) $m=1, n=-3$

**39.** If $z = (\lambda + 3) + i\sqrt{(5 - \lambda^2)}$ ; then the locus of $z$ is :

(1) a Straight line (2) a Parabola

(3) a Circle (4) a Hyperbola

**40.** If $8i\,z^3 + 12z^2 - 18z + 27i = 0$, (where $i = \sqrt{-1}$), then :

(1) $|z| = \frac{3}{2}$ (2) $|z| = \frac{2}{3}$

(3) $|z| = 1$ (4) $|z| = \frac{3}{4}$

**41.** If $n$ is a positive integer but not a multiple of 3 and $z = -1 + i\sqrt{3}$, (where $i = \sqrt{-1}$), then $(z^{2n} + 2^n \cdot z^n + 2^{2n})$ is equal to :

(1) $-1$ (2) 1

(3) $2^n$ (4) 0

**42.** The value of $\alpha$ for which the equation $(\alpha + 5)\,x^2 - (2\alpha + 1)x + (\alpha - 1) = 0$ has roots equal in magnitude but opposite in sign, is :

(1) $-5$ (2) $-\frac{1}{2}$

(3) $\frac{7}{4}$ (4) 1

**43.** Let $\alpha$, $\beta$ be the roots of the equation $(x - a)\,(x - b) = c$, $c \neq 0$. Then the roots of the equation $(x - \alpha)\,(x - \beta) + c = 0$ are :

(1) $a, c$ (2) $b, c$

(3) $a, b$ (4) $a + c, b + c$

**44.** If α, β are the roots of the equation $x^2 + x\sqrt{\alpha} + \beta = 0$, then the values of α and β are :

(1) $\alpha = 1, \beta = -2$ (2) $\alpha = 1, \beta = -1$

(3) $\alpha = 2, \beta = 1$ (4) $\alpha = 2, \beta = -2$

**45.** The number of diagonals that can be drawn in an octagon is :

(1) 16 (2) 18

(3) 28 (4) 20

**46.** If $n$ is an integer between 0 and 21, then the minimum value of $\underline{|n} \cdot \underline{|21-n}$ is :

(1) $\underline{|20}$ (2) $\underline{|10} \cdot \underline{|11}$

(3) $\underline{|21}$ (4) $\dfrac{\underline{|11}}{\underline{|10}}$

**47.** The number of numbers less than 1000 that can be formed out of the digits 0, 1, 2, 4 and 5, no digit being repeated is :

(1) 69 (2) 130

(3) 68 (4) None of these

**48.** The number of six digit numbers that can be formed from the digits 1, 2, 3, 4, 5, 6 and 7, so that digits don't repeat and the terminal digits are even is :

(1) 720 (2) 72

(3) 288 (4) 144

**49.** The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is :

(1) 50 (2) 51

(3) 150 (4) 102

**50.** For a positive integer $n$, if the expansion of $(2x^{-1} + x^{2})^{n}$ has a term independent of $x$, then a possible value for $n$ is :

(1) 22 (2) 16

(3) 10 (4) 18

**51.** The term independent of $x$ in the expansion of $[(t^{-1} - 1)\,x + (t^{-1} + 1)^{-1} x^{-1}]^{8}$ is :

(1) $70\left(\frac{1-t}{1+t}\right)^{4}$ (2) $70\left(\frac{1+t}{1-t}\right)^{4}$

(3) $56\left(\frac{1+t}{1-t}\right)^{3}$ (4) $56\left(\frac{1-t}{1+t}\right)^{3}$

**52.** In the expansion of $(1 + x)^{43}$, the coefficients of the $(2r + 1)$th and $(r + 2)$th terms are equal, then the value of $r$ is :

(1) 16 (2) 15 (3) 14 (4) 13

**53.** An infinite G. P. has first term $x$ and sum 5, then $x$ belongs to :

(1) $x < -10$ (2) $0 < x < 10$

(3) $-10 < x < 0$ (4) $x > 0$

**54.** In the quadratic equation $ax^{2} + bx + c = 0$, if $\Delta = b^{2} - 4ac$ and $\alpha + \beta$, $\alpha^{2} + \beta^{2}$, $\alpha^{3} + \beta^{3}$ are in G.P., where $\alpha$, $\beta$ are the roots of $ax^{2} + bx + c = 0$, then :

(1) $\Delta \neq 0$ (2) $b\Delta = 0$

(3) $\Delta = 0$ (4) $c\Delta = 0$

**55.** If the sum of first $n$ positive integers is $\frac{1}{5}$ times the sum of their squares, then $n$ equals :

(1) 7 (2) 8 (3) 5 (4) 6

**56.** If $\frac{a+bx}{a-bx}=\frac{b+cx}{b-cx}=\frac{c+dx}{c-dx}$ $(x \neq 0)$, then $a$, $b$, $c$, $d$ are in :

(1) AP
(2) GP
(3) HP
(4) None of these

**57.** The line $3x - 4y + 7 = 0$ is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point (–1, 1). The equation of the line in its new position is :

(1) $7y - x + 6 = 0$
(2) $7y - x - 6 = 0$
(3) $7y + x - 6 = 0$
(4) $7y + x + 6 = 0$

**58.** The diagonals of the parallelogram whose sides are $lx + my + n = 0$, $lx + my + n' = 0$, $mx + ly + n = 0$, $mx + ly + n' = 0$ include an angle :

(1) $\frac{\pi}{6}$
(2) $\frac{\pi}{3}$
(3) $\frac{\pi}{4}$
(4) $\frac{\pi}{2}$

**59.** If an equilateral triangle has one side given by $x + y - 2 = 0$ and its centroid is at the origin, then one vertex of the triangle is :

(1) (–2, –2)
(2) (–2, 2)
(3) (2, –2)
(4) (–1, –1)

**60.** If each of the points $(x_1, 4)$, $(-2, y_1)$ lies on the line joining the points (2, –1), (5, –3), then the point $P(x_1, y_1)$ lies on the line :

(1) $2x + 6y + 1 = 0$
(2) $2x + 3y - 6 = 0$
(3) $6(x + y) - 23 = 0$
(4) $6(x + y) - 25 = 0$

**61.** Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is :

(1) 2 (2) 4

(3) 8 (4) 5

**62.** The distances from the foci of $P(a, b)$ on the ellipse $\frac{x^2}{9} + \frac{y^2}{25} = 1$ are :

(1) $4 \pm \frac{5}{4}b$ (2) $5 \pm \frac{4}{5}a$

(3) $5 \pm \frac{4}{5}b$ (4) None of these

**63.** Two conics $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $x^2 = -\frac{a}{b}y$ intersect, if :

(1) $a^2 < \frac{1}{4}$ (2) $a^2 > \frac{1}{4}$

(3) $a^2 = \frac{1}{4}$ (4) None of these

**64.** The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$, and having its centre (0, 3) is :

(1) 3 (2) $\sqrt{3}$

(3) 2 (4) 4

**65.** The locus of the point, the sum of squares of whose distance, from the planes $x - z = 0$, $x - 2y + z = 0$ and $x + y + z = 0$ is 36 is given by :

(1) $x^2 + y^2 + z^2 = 6$ (2) $x^{-2} + y^{-2} + z^{-2} = \frac{1}{36}$

(3) $x^2 + y^2 + z^2 = 36$ (4) $x^2 + y^2 + z^2 = 216$

**66.** The equation of the plane through the point (2, 5, –3) perpendicular to the planes $x + 2y + 2z = 1$ and $x - 2y + 3z = 4$ is :

(1) $3x - 4y + 2z = 20$

(2) $10x - y - 4z = 27$

(3) $3x + 4y - 2z = 20$

(4) $10x + y + 4z = 27$

**67.** A line makes angles $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube. Then $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta$ is :

(1) $\frac{4}{3}$

(2) $\frac{1}{3}$

(3) $\frac{2}{3}$

(4) $\frac{3}{4}$

**68.** The symmetric form of the equations of the line $x + y - z = 1, 2x - 3y + z = 2$ is :

(1) $\frac{x}{2} = \frac{y}{3} = \frac{z}{5}$

(2) $\frac{x}{2} = \frac{y}{3} = \frac{z-1}{5}$

(3) $\frac{x}{3} = \frac{y}{2} = \frac{z}{5}$

(4) $\frac{x-1}{2} = \frac{y}{3} = \frac{z}{5}$

**69.** If $A = \cos(\cos x) + \sin(\cos x)$, the least and greatest value of $A$ are :

(1) 0 and 2

(2) –1 and 1

(3) $-\sqrt{2}$ and $\sqrt{2}$

(4) $\frac{1}{\sqrt{2}}$ and $\sqrt{2}$

**70.** The least value of $\operatorname{cosec}^2 x + 25 \sec^2 x$ is :

(1) 38

(2) 36

(3) 34

(4) 32

**71.** If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to :

(1) 0
(2) 1
(3) 2
(4) 3

**72.** If $\tan x \tan y = a$ and $x + y = \frac{\pi}{6}$, then $\tan x$ and $\tan y$ satisfy the equation :

(1) $x^2 - \sqrt{3}\,(1-a)\,x + a = 0$
(2) $x^2 + \sqrt{3}\,(1-a)\,x + a = 0$
(3) $\sqrt{3}x^2 + (1+a)\,x - a\sqrt{3} = 0$
(4) $\sqrt{3}x^2 - (1-a)\,x + a\sqrt{3} = 0$

**73.** Fifteen coupons are numbered 1, 2, 3, ........, 15 respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is atmost 9, is :

(1) $\left(\frac{1}{15}\right)^7$
(2) $\left(\frac{8}{15}\right)^7$
(3) $\left(\frac{3}{5}\right)^7$
(4) $\left(\frac{4}{5}\right)^7$

**74.** The probability of guessing correctly at least 8 out of 10 answers on a true-false examination, is :

(1) $\frac{7}{128}$
(2) $\frac{7}{64}$
(3) $\frac{45}{1024}$
(4) $\frac{175}{1024}$

**75.** A fair die is thrown untill a score of less than five points is obtained. The probability of obtaining less than three points on the last throw is :

(1) $\frac{3}{4}$
(2) $\frac{1}{2}$
(3) $\frac{4}{5}$
(4) $\frac{5}{6}$

**76.** Two players A and B throw a die alternately for a prize of Rs. 11, which is to be won by a player who first throws a six. If A starts the game, their respective expectations are :

(1) Rs. 7; Rs. 4
(2) Rs. 8; Rs. 3
(3) Rs. 6; Rs. 5
(4) Rs. 6; Rs. 5

**77.** The mean of 8 observations is 9 and their variance is 9.25. If six of the observations are 6, 7, 10, 12, 12 and 13, then the remaining two observations are :

(1) 8, 6
(2) 8, 5
(3) 8, 4
(4) 8, 3

**78.** The frequencies of values 0, 1, 2, ........., $n$ of a variable are $q^n$, ${}^nc_1\, q^{n-1}\, p^1$, ${}^nc_2\, q^{n-2}\, p^2$, ........, $p^n$, where $p + q = 1$. The mean is :

(1) $n + p$
(2) $np$
(3) $\frac{n}{p}$
(4) $n - p$

**79.** Which of the following is ***not*** a merit of Mean Deviation ?

(1) It is unduly affected by the presence of extreme items
(2) It is based on all the items
(3) It can be calculated by using any average
(4) None of these

**80.** The variance of 20 observations is 5. If each observation is multiplied by 2, find th new variance of the resulting observations.

(1) 100
(2) 50
(3) 40
(4) 20

**81.** The range of the function $f(x) = 3|\sin x| - 2|\cos x|$ is :

(1) $[-2, \sqrt{13}]$
(2) $[-2, 3]$
(3) $[-3, 2]$
(4) $[3, \sqrt{13}]$

**82.** Let $f : R \rightarrow \left[0, \frac{\pi}{2}\right)$ be a function defined by $f(x) = \tan^{-1}(x^2 + x + a)$. If $f$ is onto, then a equals :

(1) $\frac{1}{4}$
(2) $\frac{1}{2}$
(3) 1
(4) 0

**83.** If the domain of $f(x)$ is (0, 1), then the domain of $f(e^x) + f(\ln|x|)$ is :

(1) $(-1, e)$
(2) $(-e, -1)$
(3) $(-e, 1)$
(4) $(1, e)$

**84.** Let $f : R \rightarrow R$ be a function defined by $f(x) = \dfrac{x^2 + 2x + 5}{x^2 + x + 1}$. The function $f(x)$ is :

(1) one-one and into
(2) one-one and onto
(3) many one and onto
(4) many one and into

**85.** The probability that at least one of the events A and B occurs is $\frac{3}{5}$. If A and B occur simultaneously with probability $\frac{1}{5}$, then $P(\overline{A}) + P(\overline{B})$ is :

(1) $\frac{2}{5}$
(2) $\frac{4}{5}$
(3) $\frac{6}{5}$
(4) $\frac{7}{5}$

**86.** A bag contains 16 coins of which two are counterfeit with heads on both sides. The rest are fair coins. One is selected at random from the bag and tossed. The probability of getting a head is :

(1) $\frac{9}{16}$ (2) $\frac{11}{16}$

(3) $\frac{13}{16}$ (4) $\frac{15}{16}$

**87.** An urn contains five balls. Two balls are drawn and are found to be white. The probability that all the balls are white is :

(1) $\frac{2}{5}$ (2) $\frac{1}{2}$

(3) $\frac{3}{5}$ (4) $\frac{1}{3}$

**88.** A box contains 6 nails and 10 nuts. Half of the nails and half of the nuts are rusted. If one item is chosen at random, the probability that it is rusted or is a nails is :

(1) $\frac{3}{16}$ (2) $\frac{5}{16}$

(3) $\frac{9}{16}$ (4) $\frac{11}{16}$

**89.** The maximum value of $P = 6x + 8y$ subject to constraints $2x + y \leq 30$, $x + 2y \leq 24$, $x \geq 0, y \geq 0$ is :

(1) 90 (2) 96

(3) 120 (4) 240

**90.** The number of proper subsets of the set $\{1, 2, 3\}$ is :

(1) 6 (2) 7

(3) 8 (4) 9

**91.** In a city 20 per cent of the population travels by car, 50 per cent travels by bus and 10 per cent travels by both car and bus. Then persons travelling by car or bus is :

(1) 40 per cent

(2) 60 per cent

(3) 70 per cent

(4) 80 per cent

**92.** Let $n(U) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$, then $n(A^C \cap B^C)$ is :

(1) 600

(2) 400

(3) 200

(4) 300

**93.** If A and B are two sets, then $A \cup B = A \cap B$ iff :

(1) $A \subseteq B$

(2) $B \subseteq A$

(3) $A = B$

(4) None of these

**94.** The Relation $R$ in $N$ defined by ${}_aR_b \Leftrightarrow a^2 - 4ab + 3b^2 = 0$, $(a, b \in N)$ is :

(1) Reflexive

(2) Symmetric

(3) Transitive

(4) None of these

**95.** If $0 < a < b$, then $\lim_{n\to\infty}(b^n + a^n)^{1/n}$ is equal to :

(1) $e$

(2) $b$

(3) $a$

(4) None of these

**96.** The set of all points, where $f(x) = 3\sqrt{x^2\,|\,x\,|} - |\,x\,| - 1$ is not differentiable is :

(1) $\{0\}$

(2) $\{-1, 0, 1\}$

(3) $\{0, 1\}$

(4) None of these

**97.** The points of discontinuity of the function $f(x) = \lim \frac{(2\sin x)^{2n}}{3^n - (2\cos x)^{2n}}$ are given by :

(1) $r\pi + \frac{\pi}{12}, r \in I$

(2) $r\pi + \frac{\pi}{3}, r \in I$

(3) $r\pi \pm \frac{\pi}{6}, r \in I$

(4) None of these

**98.** The negation of $p \to q$ is :

(1) $p \wedge \sim q$

(2) $q \to p$

(3) $q' \to p$

(4) $p \to q'$

**99.** The disjunction $p \vee q$ is false only when :

(1) $p$ is false

(2) $q$ is false

(3) $p$ and $q$ are both false

(4) None of these

**100.** If $A = \{1, 3, 5, 7\}$, $B = \{2, 5\}$, then the number of relations from A to B is :

(1) 256

(2) 128

(3) 64

(4) 32

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**B**

**SET-X**

# PG-EE-2022

# SUBJECT : Mathematics Hons. (Five Year)

Sr. No. 10006

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)__________ (in words) __________

Name __________ Father's Name __________

Mother's Name __________ Date of Examination __________

__________ (Signature of the Candidate) __________ (Signature of the Invigilator)

## CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail (coe@mdurohtak.ac.in) within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

**1.** If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to :

(1) 0 (2) 1

(3) 2 (4) 3

**2.** If $\tan x \tan y = a$ and $x + y = \frac{\pi}{6}$, then $\tan x$ and $\tan y$ satisfy the equation :

(1) $x^2 - \sqrt{3}\,(1-a)x + a = 0$ (2) $x^2 + \sqrt{3}\,(1-a)x + a = 0$

(3) $\sqrt{3}x^2 + (1+a)x - a\sqrt{3} = 0$ (4) $\sqrt{3}x^2 - (1-a)x + a\sqrt{3} = 0$

**3.** Fifteen coupons are numbered 1, 2, 3, ........, 15 respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is atmost 9, is :

(1) $\left(\frac{1}{15}\right)^7$ (2) $\left(\frac{8}{15}\right)^7$

(3) $\left(\frac{3}{5}\right)^7$ (4) $\left(\frac{4}{5}\right)^7$

**4.** The probability of guessing correctly at least 8 out of 10 answers on a true-false examination, is :

(1) $\frac{7}{128}$ (2) $\frac{7}{64}$

(3) $\frac{45}{1024}$ (4) $\frac{175}{1024}$

**5.** A fair die is thrown untill a score of less than five points is obtained. The probability of obtaining less than three points on the last throw is :

(1) $\frac{3}{4}$ (2) $\frac{1}{2}$

(3) $\frac{4}{5}$ (4) $\frac{5}{6}$

**6.** Two players A and B throw a die alternately for a prize of Rs. 11, which is to be won by a player who first throws a six. If A starts the game, their respective expectations are :

(1) Rs. 7; Rs. 4 (2) Rs. 8; Rs. 3

(3) Rs. 6; Rs. 5 (4) Rs. 6; Rs. 5

**7.** The mean of 8 observations is 9 and their variance is 9.25. If six of the observations are 6, 7, 10, 12, 12 and 13, then the remaining two observations are :

(1) 8, 6 (2) 8, 5

(3) 8, 4 (4) 8, 3

**8.** The frequencies of values 0, 1, 2, ........., $n$ of a variable are $q^n$, ${}^nc_1\, q^{n-1}\, p^1$, ${}^nc_2\, q^{n-2}$ $p^2$, ........, $p^n$, where $p + q = 1$. The mean is :

(1) $n+p$ (2) $np$

(3) $\frac{n}{p}$ (4) $n-p$

**9.** Which of the following is ***not*** a merit of Mean Deviation ?

(1) It is unduly affected by the presence of extreme items

(2) It is based on all the items

(3) It can be calculated by using any average

(4) None of these

**10.** The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.

(1) 100 (2) 50

(3) 40 (4) 20

**11.** The term independent of $x$ in the expansion of $[(t^{-1}-1)\,x+(t^{-1}+1)^{-1}x^{-1}]^8$ is :

(1) $70\left(\frac{1-t}{1+t}\right)^4$ (2) $70\left(\frac{1+t}{1-t}\right)^4$

(3) $56\left(\frac{1+t}{1-t}\right)^3$ (4) $56\left(\frac{1-t}{1+t}\right)^3$

**12.** In the expansion of $(1+x)^{43}$, the coefficients of the $(2r+1)$th and $(r+2)$th terms are equal, then the value of $r$ is :

(1) 16 (2) 15 (3) 14 (4) 13

**13.** An infinite G. P. has first term $x$ and sum 5, then $x$ belongs to :

(1) $x<-10$ (2) $0<x<10$

(3) $-10<x<0$ (4) $x>0$

**14.** In the quadratic equation $ax^2+bx+c=0$, if $\Delta=b^2-4ac$ and $\alpha+\beta,\ \alpha^2+\beta^2,\ \alpha^3+\beta^3$ are in G.P., where $\alpha$, $\beta$ are the roots of $ax^2+bx+c=0$, then :

(1) $\Delta\neq 0$ (2) $b\Delta=0$

(3) $\Delta=0$ (4) $c\Delta=0$

**15.** If the sum of first $n$ positive integers is $\frac{1}{5}$ times the sum of their squares, then $n$ equals :

(1) 7 (2) 8 (3) 5 (4) 6

**16.** If $\frac{a+bx}{a-bx}=\frac{b+cx}{b-cx}=\frac{c+dx}{c-dx}\ (x\neq 0)$, then $a$, $b$, $c$, $d$ are in :

(1) AP (2) GP

(3) HP (4) None of these

**17.** The line $3x - 4y + 7 = 0$ is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point $(-1, 1)$. The equation of the line in its new position is :

(1) $7y - x + 6 = 0$ (2) $7y - x - 6 = 0$

(3) $7y + x - 6 = 0$ (4) $7y + x + 6 = 0$

**18.** The diagonals of the parallelogram whose sides are $lx + my + n = 0$, $lx + my + n' = 0$, $mx + ly + n = 0$, $mx + ly + n' = 0$ include an angle :

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$

(3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$

**19.** If an equilateral triangle has one side given by $x + y - 2 = 0$ and its centroid is at the origin, then one vertex of the triangle is :

(1) $(-2, -2)$ (2) $(-2, 2)$

(3) $(2, -2)$ (4) $(-1, -1)$

**20.** If each of the points $(x_1, 4)$, $(-2, y_1)$ lies on the line joining the points $(2, -1)$, $(5, -3)$, then the point $P(x_1, y_1)$ lies on the line :

(1) $2x + 6y + 1 = 0$ (2) $2x + 3y - 6 = 0$

(3) $6(x + y) - 23 = 0$ (4) $6(x + y) - 25 = 0$

**21.** The range of the function $f(x) = 3|\sin x| - 2|\cos x|$ is :

(1) $[-2, \sqrt{13}]$ (2) $[-2, 3]$

(3) $[-3, 2]$ (4) $[3, \sqrt{13}]$

**22.** Let $f : R \to \left[0, \frac{\pi}{2}\right)$ be a function defined by $f(x) = \tan^{-1}(x^2 + x + a)$. If $f$ is onto, then $a$ equals :

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) 1 (4) 0

**23.** If the domain of $f(x)$ is (0, 1), then the domain of $f(e^x) + f(\ln |x|)$ is :

(1) $(-1, e)$ (2) $(-e, -1)$

(3) $(-e, 1)$ (4) $(1, e)$

**24.** Let $f : R \to R$ be a function defined by $f(x) = \frac{x^2 + 2x + 5}{x^2 + x + 1}$. The function $f(x)$ is :

(1) one-one and into (2) one-one and onto

(3) many one and onto (4) many one and into

**25.** The probability that at least one of the events A and B occurs is $\frac{3}{5}$. If A and B occur simultaneously with probability $\frac{1}{5}$, then $P(\overline{A}) + P(\overline{B})$ is :

(1) $\frac{2}{5}$ (2) $\frac{4}{5}$

(3) $\frac{6}{5}$ (4) $\frac{7}{5}$

**26.** A bag contains 16 coins of which two are counterfeit with heads on both sides. The rest are fair coins. One is selected at random from the bag and tossed. The probability of getting a head is :

(1) $\frac{9}{16}$ (2) $\frac{11}{16}$ (3) $\frac{13}{16}$ (4) $\frac{15}{16}$

**27.** An urn contains five balls. Two balls are drawn and are found to be white. The probability that all the balls are white is :

(1) $\frac{2}{5}$

(2) $\frac{1}{2}$

(3) $\frac{3}{5}$

(4) $\frac{1}{3}$

**28.** A box contains 6 nails and 10 nuts. Half of the nails and half of the nuts are rusted. If one item is chosen at random, the probability that it is rusted or is a nails is :

(1) $\frac{3}{16}$

(2) $\frac{5}{16}$

(3) $\frac{9}{16}$

(4) $\frac{11}{16}$

**29.** The maximum value of $P = 6x + 8y$ subject to constraints $2x + y \leq 30$, $x + 2y \leq 24$, $x \geq 0, y \geq 0$ is :

(1) 90

(2) 96

(3) 120

(4) 240

**30.** The number of proper subsets of the set $\{1, 2, 3\}$ is :

(1) 6

(2) 7

(3) 8

(4) 9

**31.** Let $f(x)$ be a differential function for all $x$. If $f(1) = -2$ and $f'(x) \geq 2$ for all $x$ in $[1, 6]$, then minimum value of $f(6)$ is equal to :

(1) 4

(2) 6

(3) 2

(4) 8

**32.** The minimum value of $\left(1+\frac{1}{\sin^{n}\alpha}\right)\left(1+\frac{1}{\cos^{n}\alpha}\right)$ is equal to :

(1) 1

(2) $(1+2^{n/2})^2$

(3) $-1$

(4) $\frac{1+2^{n/2}}{1-2^{n/2}}$

**33.** If $\int f(x)\cos x\,dx=\frac{1}{2}\{f(x)\}^2+c$, then $f(x)$ is given by :

(1) $\sin x+c$

(2) $\cos x+c$

(3) $x+c$

(4) $c$

**34.** $\int(x-{}^{11}c_1x^2+{}^{11}c_2x^3-{}^{11}c_3x^4+\ldots\ldots\ldots\ldots-{}^{11}c_{11}x^{12})\,dx$ is equal to :

(1) $\frac{(1-x)^{13}}{13}-\frac{(1-x)^{12}}{12}+c$

(2) $\frac{(1-x)^{12}}{12}+\frac{(1-x)^{13}}{13}+c$

(3) $\frac{(1-x)^{13}}{12}+\frac{(1-x)^{12}}{13}+c$

(4) None of these

**35.** If $\int_0^1\frac{e^t}{t+1}\,dt=a$, then $\int_{b-1}^{b}\frac{e^{-t}}{t-b-1}\,dt$ is equal to :

(1) $ae^{-b}$

(2) $ae^{b}$

(3) $-ae^{-b}$

(4) $-be^{-a}$

**36.** The value of $\int_0^2[x^2-x+1]dx$ (where $[\cdot]$ denotes the greatest integer function) is given by :

(1) $\frac{7-\sqrt{5}}{2}$

(2) $\frac{8-\sqrt{5}}{2}$

(3) $\frac{6-\sqrt{5}}{2}$

(4) $\frac{5-\sqrt{5}}{2}$

**37.** The value of the integral $\int_{1/e}^{e} |\ln x|\, dx$ is :

(1) $1-\frac{1}{e}$

(2) $2\left(1-\frac{1}{e}\right)$

(3) $\frac{1}{e}-1$

(4) $(e-1)^{-1}$

**38.** The area bounded by $y=\frac{\sin x}{x}$, $x-$ axis and the ordinates $x=0, x=\frac{\pi}{4}$ is :

(1) $=\frac{\pi}{4}$

(2) $>\frac{\pi}{4}$

(3) $<\frac{\pi}{4}$

(4) 0

**39.** The area between the curve $y=-x^2+2x^4$, the $x$-axis and the ordinates of two minima of the curve is :

(1) $\frac{7}{120}$ sq unit

(2) $\frac{9}{120}$ sq unit

(3) $\frac{11}{120}$ sq unit

(4) $\frac{13}{120}$ sq unit

**40.** The value of $f(0)$, so that the function $f(x)=\frac{1-\cos(1-\cos x)}{x^4}$ is continuous everywhere is :

(1) $\frac{1}{4}$

(2) $\frac{1}{8}$

(3) $\frac{1}{2}$

(4) None of these

**41.** In a city 20 per cent of the population travels by car, 50 per cent travels by bus and 10 per cent travels by both car and bus. Then persons travelling by car or bus is :

(1) 40 per cent (2) 60 per cent

(3) 70 per cent (4) 80 per cent

**42.** Let $n(U) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$, then $n(A^C \cap B^C)$ is :

(1) 600 (2) 400

(3) 200 (4) 300

**43.** If A and B are two sets, then $A \cup B = A \cap B$ iff :

(1) $A \subseteq B$ (2) $B \subseteq A$

(3) $A = B$ (4) None of these

**44.** The Relation $R$ in $N$ defined by ${}_aR_b \Leftrightarrow a^2 - 4ab + 3b^2 = 0$, $(a, b \in N)$ is :

(1) Reflexive (2) Symmetric

(3) Transitive (4) None of these

**45.** If $0 < a < b$, then $\lim\limits_{n \to \infty}(b^n + a^n)^{1/n}$ is equal to :

(1) $e$ (2) $b$

(3) $a$ (4) None of these

**46.** The set of all points, where $f(x) = 3\sqrt{x^2 \, |x|} - |x| - 1$ is not differentiable is :

(1) $\{0\}$ (2) $\{-1, 0, 1\}$

(3) $\{0, 1\}$ (4) None of these

**47.** The points of discontinuity of the function $f(x) = \lim \dfrac{(2\sin x)^{2n}}{3^n - (2\cos x)^{2n}}$ are given by :

(1) $r\pi + \dfrac{\pi}{12}, r \in I$

(2) $r\pi + \dfrac{\pi}{3}, r \in I$

(3) $r\pi \pm \dfrac{\pi}{6}, r \in I$

(4) None of these

**48.** The negation of $p \rightarrow q$ is :

(1) $p \wedge \sim q$

(2) $q \rightarrow p$

(3) $q' \rightarrow p$

(4) $p \rightarrow q'$

**49.** The disjunction $p \vee q$ is false only when :

(1) $p$ is false

(2) $q$ is false

(3) $p$ and $q$ are both false

(4) None of these

**50.** If $A = \{1, 3, 5, 7\}$, $B = \{2, 5\}$, then the number of relations from A to B is :

(1) 256

(2) 128

(3) 64

(4) 32

**51.** Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is :

(1) 2

(2) 4

(3) 8

(4) 5

**52.** The distances from the foci of $P(a, b)$ on the ellipse $\dfrac{x^2}{9} + \dfrac{y^2}{25} = 1$ are :

(1) $4 \pm \dfrac{5}{4}b$

(2) $5 \pm \dfrac{4}{5}a$

(3) $5 \pm \dfrac{4}{5}b$

(4) None of these

**53.** Two conics $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $x^2=-\frac{a}{b}y$ intersect, if :

(1) $a^2<\frac{1}{4}$

(2) $a^2>\frac{1}{4}$

(3) $a^2=\frac{1}{4}$

(4) None of these

**54.** The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$, and having its centre (0, 3) is :

(1) 3

(2) $\sqrt{3}$

(3) 2

(4) 4

**55.** The locus of the point, the sum of squares of whose distance, from the planes $x-z=0$, $x-2y+z=0$ and $x+y+z=0$ is 36 is given by :

(1) $x^2+y^2+z^2=6$

(2) $x^{-2}+y^{-2}+z^{-2}=\frac{1}{36}$

(3) $x^2+y^2+z^2=36$

(4) $x^2+y^2+z^2=216$

**56.** The equation of the plane through the point (2, 5, –3) perpendicular to the planes $x+2y+2z=1$ and $x-2y+3z=4$ is :

(1) $3x-4y+2z=20$

(2) $10x-y-4z=27$

(3) $3x+4y-2z=20$

(4) $10x+y+4z=27$

**57.** A line makes angles α, β, γ, δ with the four diagonals of a cube. Then $\cos^2\alpha+\cos^2\beta+\cos^2\gamma+\cos^2\delta$ is :

(1) $\frac{4}{3}$

(2) $\frac{1}{3}$

(3) $\frac{2}{3}$

(4) $\frac{3}{4}$

**58.** The symmetric form of the equations of the line $x + y - z = 1, 2x - 3y + z = 2$ is :

(1) $\frac{x}{2} = \frac{y}{3} = \frac{z}{5}$

(2) $\frac{x}{2} = \frac{y}{3} = \frac{z-1}{5}$

(3) $\frac{x}{3} = \frac{y}{2} = \frac{z}{5}$

(4) $\frac{x-1}{2} = \frac{y}{3} = \frac{z}{5}$

**59.** If $A = \cos(\cos x) + \sin(\cos x)$, the least and greatest value of $A$ are :

(1) 0 and 2

(2) $-1$ and 1

(3) $-\sqrt{2}$ and $\sqrt{2}$

(4) $\frac{1}{\sqrt{2}}$ and $\sqrt{2}$

**60.** The least value of $\operatorname{cosec}^2 x + 25 \sec^2 x$ is :

(1) 38

(2) 36

(3) 34

(4) 32

**61.** If $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{a} + \vec{b}| = 5$, then $|\vec{a} - \vec{b}|$ is equal to :

(1) 5

(2) 4

(3) 2

(4) 1

**62.** If $(\vec{a} \times \vec{b})^2 + (\vec{a} . \vec{b})^2 = 144$ and $|\vec{a}| = 4$, then $|\vec{b}|$ is equal to :

(1) 4

(2) 3

(3) 1

(4) 2

**63.** Let $|\vec{a}| = 1, |\vec{b}| = 2, |\vec{c}| = 3$ and $\vec{a} \perp (\vec{b} + \vec{c}), \vec{b} \perp (\vec{c} + \vec{a}), \vec{c} \perp (\vec{a} + \vec{b})$. Then $|\vec{a} + \vec{b} + \vec{c}|$ is :

(1) $\sqrt{10}$

(2) $\sqrt{12}$

(3) $\sqrt{8}$

(4) $\sqrt{14}$

**64.** Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} \neq 0$ and $\vec{a} \times \vec{b} = 2\,\vec{a} \times \vec{c}, |\vec{a}| = |\vec{c}| = 1, |\vec{b}| = 4$ and $|\vec{b} \times \vec{c}| = \sqrt{15}$. If $\vec{b} - 2\vec{c} = \lambda\vec{a}$, then $\lambda$ is equal to :

(1) 1 (2) 3 (3) $-4$ (4) 2

**65.** The point on the line $\frac{x-2}{1} = \frac{y+3}{-2} = \frac{z+5}{-2}$ at a distance of 6 from the point (2, –3, –5) is :

(1) (4, –7, –9)
(2) (4, 7, 9)
(3) (3, –5, –3)
(4) (–3, 5, 3)

**66.** The coordinates of the centroid of the triangle ABC, where A, B, C are the points of intersection of the plane $6x + 3y - 2z = 18$ with the coordinate axes are :

(1) (–1, 2, 3)
(2) (1, 2, –3)
(3) (–1, –2, –3)
(4) (1, –2, 3)

**67.** The points (8, –5, 6), (11, 1, 8), (9, 4, 2) and (6, –2, 0) are the vertices of a :

(1) Rhombus
(2) Rectangle
(3) Parallelogram
(4) Square

**68.** The plane containing the two lines $\frac{x-3}{1} = \frac{y-2}{4} = \frac{z-1}{5}$ and $\frac{x-2}{1} = \frac{y+3}{-4} = \frac{z+1}{5}$ is $11x + my + nz = 28$, where :

(1) $m = -1, n = 3$
(2) $m = -1, n = -3$
(3) $m = 1, n = 3$
(4) $m = 1, n = -3$

**69.** If $z = (\lambda + 3) + i\sqrt{(5 - \lambda^2)}$ ; then the locus of $z$ is :

(1) a Straight line
(2) a Parabola
(3) a Circle
(4) a Hyperbola

**70.** If $8iz^3 + 12z^2 - 18z + 27i = 0$, (where $i = \sqrt{-1}$), then :

(1) $|z| = \frac{3}{2}$

(2) $|z| = \frac{2}{3}$

(3) $|z| = 1$

(4) $|z| = \frac{3}{4}$

**71.** If $n$ is a positive integer but not a multiple of 3 and $z = -1 + i\sqrt{3}$, (where $i = \sqrt{-1}$), then $(z^{2n} + 2^n . z^n + 2^{2n})$ is equal to :

(1) $-1$

(2) 1

(3) $2^n$

(4) 0

**72.** The value of $\alpha$ for which the equation $(\alpha + 5)x^2 - (2\alpha + 1)x + (\alpha - 1) = 0$ has roots equal in magnitude but opposite in sign, is :

(1) $-5$

(2) $-\frac{1}{2}$

(3) $\frac{7}{4}$

(4) 1

**73.** Let $\alpha$, $\beta$ be the roots of the equation $(x - a)(x - b) = c$, $c \neq 0$. Then the roots of the equation $(x - \alpha)(x - \beta) + c = 0$ are :

(1) $a, c$

(2) $b, c$

(3) $a, b$

(4) $a + c, b + c$

**74.** If $\alpha$, $\beta$ are the roots of the equation $x^2 + x\sqrt{\alpha} + \beta = 0$, then the values of $\alpha$ and $\beta$ are :

(1) $\alpha = 1, \beta = -2$

(2) $\alpha = 1, \beta = -1$

(3) $\alpha = 2, \beta = 1$

(4) $\alpha = 2, \beta = -2$

**75.** The number of diagonals that can be drawn in an octagon is :

(1) 16
(2) 18
(3) 28
(4) 20

**76.** If $n$ is an integer between 0 and 21, then the minimum value of $\underline{|n} \cdot \underline{|21-n}$ is :

(1) $\underline{|20}$
(2) $\underline{|10} \cdot \underline{|11}$
(3) $\underline{|21}$
(4) $\dfrac{\underline{|11}}{\underline{|10}}$

**77.** The number of numbers less than 1000 that can be formed out of the digits 0, 1, 2, 4 and 5, no digit being repeated is :

(1) 69
(2) 130
(3) 68
(4) None of these

**78.** The number of six digit numbers that can be formed from the digits 1, 2, 3, 4, 5, 6 and 7, so that digits don't repeat and the terminal digits are even is :

(1) 720
(2) 72
(3) 288
(4) 144

**79.** The total number of terms in the expansion of $(x+a)^{100} + (x-a)^{100}$ after simplification is :

(1) 50
(2) 51
(3) 150
(4) 102

**80.** For a positive integer $n$, if the expansion of $(2x^{-1} + x^{2})^{n}$ has a term independent of $x$, then a possible value for $n$ is :

(1) 22
(2) 16
(3) 10
(4) 18

**81.** The value of '$a$' for which $ax^2 + \sin^{-1}(x^2 - 2x + 2) + \cos^{-1}(x^2 - 2x + 2) = 0$ has a real solution, is :

(1) $\frac{2}{\pi}$

(2) $-\frac{2}{\pi}$

(3) $\frac{\pi}{2}$

(4) $-\frac{\pi}{2}$

**82.** If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 3\pi$, then $xy + yz + zx$ is equal to :

(1) 0

(2) –3

(3) 3

(4) –1

**83.** The value of $\tan\left\{\left(\cos^{-1}\left(-\frac{2}{7}\right)-\frac{\pi}{2}\right)\right\}$ is :

(1) $\frac{2}{3\sqrt{5}}$

(2) $\frac{2}{\sqrt{3}}$

(3) $\frac{3}{\sqrt{5}}$

(4) $\frac{4}{\sqrt{5}}$

**84.** The least value of '$a$' for which $\frac{4}{\sin x}+\frac{1}{1-\sin x}=a$ has at least one solution in the interval $\left(0,\frac{\pi}{2}\right)$ is :

(1) 8

(2) 9

(3) 4

(4) 3

**85.** A spherical baloon is pumped at the rate of 10 inch$^3$/min. If radius of baloon is 15 inch, then the rate of increase of its radius is :

(1) $\frac{1}{30\pi}$ inch/min

(2) $\frac{1}{120\pi}$ inch/min

(3) $\frac{1}{60\pi}$ inch/min

(4) $\frac{1}{90\pi}$ inch/min

**86.** The order of the differential equation whose general solution is given by :

$y = (c_1 + c_2)\cos(x + c_3) - c_4 . e^{x + c_5}$, where $c_1, c_2, c_3, c_4$ and $c_5$ are arbitrary constant, is :

(1) 5

(2) 4

(3) 3

(4) 2

**87.** The real value of $n$ for which the substitution $y = u^n$ will transform the differential equation $2x^4 y\frac{dy}{dx} + y^4 = 4x^6$ into a homogeneous equation is :

(1) $\frac{3}{2}$

(2) $\frac{5}{2}$

(3) $\frac{1}{2}$

(4) 1

**88.** The differential equation representing the family of the curves $y^2 = 2c\,(x + \sqrt{c})$, where $c$ is a positive parameter, is of :

(1) order 2, degree 2

(2) order 1, degree 3

(3) order 3, degree 1

(4) None of these

**89.** The solution of the differential equation $\sin y\frac{dy}{dx}=\cos y(1-x\cos y)$ is :

(1) $\sec y = x - 1 - ce^{x}$

(2) $\sec y = x + e^{x} + c$

(3) $\sec y = x - 1 + ce^{x}$

(4) $\sec y = x + 1 + ce^{x}$

**90.** $\int\frac{3+2\cos x}{(2+3\cos x)^2}dx$ is equal to :

(1) $\left(\frac{2\cos x}{2+3\sin x}\right)+c$

(2) $\left(\frac{2\cos x}{2+3\cos x}\right)+c$

(3) $\left(\frac{\sin x}{2+3\cos x}\right)+c$

(4) $\left(\frac{\sin x}{3+2\cos x}\right)+c$

**91.** If λ is a non-real cube root of −2, then the value of $\begin{vmatrix} 1 & 2\lambda & 1 \\ \lambda^2 & 1 & 3\lambda^2 \\ 2 & 2\lambda & 1 \end{vmatrix}$ is equal to :

(1) −10

(2) −13

(3) −11

(4) −12

**92.** If $z=\begin{vmatrix} 3+2i & 5-i & 7-3i \\ i & 2i & -3i \\ 3-2i & 5+i & 7+3i \end{vmatrix}$, where $i=\sqrt{-1}$, then $z$ is :

(1) Purely Real

(2) Purely Imaginary

(3) 1

(4) 0

**93.** The value of the determinant $\begin{vmatrix} 1 & e^{i\pi/3} & e^{i\pi/4} \\ e^{-i\pi/3} & 1 & e^{2i\pi/3} \\ e^{-i\pi/4} & e^{-2i\pi/3} & 1 \end{vmatrix}$, where $i = \sqrt{-1}$ is :

(1) $2 + \sqrt{2}$

(2) $2 - \sqrt{3}$

(3) $2 + \sqrt{3}$

(4) $-(2 + \sqrt{2})$

**94.** If $A$ is a skew-symmetric matrix, then trace of $A$ is :

(1) $-1$

(2) 1

(3) 0

(4) $i$

**95.** If $A = \begin{bmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(x)$, then $A^{-1}$ is equal to :

(1) $f(x)$

(2) $f(-x)$

(3) $-f(x)$

(4) 0

**96.** If $A^2 + A - I = 0$, then $A^{-1}$ is equal to :

(1) A–I

(2) A + I

(3) I

(4) 0

**97.** If $x^y \cdot y^x = 16$, then $\frac{dy}{dx}$ at (2, 2) is :

(1) 0

(2) 1

(3) $-1$

(4) $\frac{1}{2}$

**98.** If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx}$ is equal to :

(1) 1 (2) $-1$

(3) 0 (4) $\frac{1}{2}$

**99.** If $y = \tan^{-1}\left[\frac{\log_e(e/x^2)}{\log_e(ex^2)}\right] + \tan^{-1}\left[\frac{3+2\log_e x}{1-6\log_e x}\right]$, then $\frac{d^2y}{dx^2}$ is :

(1) $-1$ (2) 1

(3) $\infty$ (4) 0

**100.** The locus of all points on the curve $y^2 = 4a\left[x + a\sin\left(\frac{x}{a}\right)\right]$ at which the tangent is parallel to $x$-axis is :

(1) Ellipse (2) Hyperbola

(3) Parabola (4) Circle

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**C**

**SET-X**

# PG-EE-2022

## SUBJECT : Mathematics Hons. (Five Year)

Sr. No. 10003

Time : **1¼ Hours**
Max. Marks : **100**
Total Questions : **100**

Roll No. (in figures) ________________ (in words) ________________

Name ________________ Father's Name ________________

Mother's Name ________________ Date of Examination ________________

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(Signature of the Candidate)

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(Signature of the Invigilator)

### CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail (coe@mdurohtak.ac.in) within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. If $n$ is a positive integer but not a multiple of 3 and $z = -1 + i\sqrt{3}$, (where $i = \sqrt{-1}$), then $(z^{2n} + 2^{n} . z^{n} + 2^{2n})$ is equal to :

(1) $-1$ (2) $1$

(3) $2^{n}$ (4) $0$

2. The value of $\alpha$ for which the equation $(\alpha + 5)\, x^{2} - (2\alpha + 1)x + (\alpha - 1) = 0$ has roots equal in magnitude but opposite in sign, is :

(1) $-5$ (2) $-\frac{1}{2}$

(3) $\frac{7}{4}$ (4) $1$

3. Let $\alpha$, $\beta$ be the roots of the equation $(x - a)\, (x - b) = c$, $c \neq 0$. Then the roots of the equation $(x - \alpha)\, (x - \beta) + c = 0$ are :

(1) $a, c$ (2) $b, c$

(3) $a, b$ (4) $a + c, b + c$

4. If $\alpha$, $\beta$ are the roots of the equation $x^2 + x\sqrt{\alpha} + \beta = 0$, then the values of $\alpha$ and $\beta$ are :

(1) $\alpha = 1, \beta = -2$ (2) $\alpha = 1, \beta = -1$

(3) $\alpha = 2, \beta = 1$ (4) $\alpha = 2, \beta = -2$

5. The number of diagonals that can be drawn in an octagon is :

(1) 16 (2) 18

(3) 28 (4) 20

**6.** If $n$ is an integer between 0 and 21, then the minimum value of $\underline{|n} \cdot \underline{|21-n}$ is :

(1) $\underline{|20}$ (2) $\underline{|10} \cdot \underline{|11}$

(3) $\underline{|21}$ (4) $\dfrac{\underline{|11}}{\underline{|10}}$

**7.** The number of numbers less than 1000 that can be formed out of the digits 0, 1, 2, 4 and 5, no digit being repeated is :

(1) 69 (2) 130

(3) 68 (4) None of these

**8.** The number of six digit numbers that can be formed from the digits 1, 2, 3, 4, 5, 6 and 7, so that digits don't repeat and the terminal digits are even is :

(1) 720 (2) 72

(3) 288 (4) 144

**9.** The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification is :

(1) 50 (2) 51

(3) 150 (4) 102

**10.** For a positive integer $n$, if the expansion of $(2x^{-1} + x^2)^n$ has a term independent of $x$, then a possible value for $n$ is :

(1) 22 (2) 16 (3) 10 (4) 18

**11.** The value of '$a$' for which $ax^2 + \sin^{-1}(x^2 - 2x + 2) + \cos^{-1}(x^2 - 2x + 2) = 0$ has a real solution, is :

(1) $\dfrac{2}{\pi}$ (2) $-\dfrac{2}{\pi}$ (3) $\dfrac{\pi}{2}$ (4) $-\dfrac{\pi}{2}$

**12.** If $\cos^{-1} x + \cos^{-1} y + \cos^{-1} z = 3\pi$, then $xy + yz + zx$ is equal to :

(1) 0
(2) $-3$
(3) 3
(4) $-1$

**13.** The value of $\tan\left\{\left(\cos^{-1}\left(-\frac{2}{7}\right)-\frac{\pi}{2}\right)\right\}$ is :

(1) $\frac{2}{3\sqrt{5}}$
(2) $\frac{2}{\sqrt{3}}$
(3) $\frac{3}{\sqrt{5}}$
(4) $\frac{4}{\sqrt{5}}$

**14.** The least value of '$a$' for which $\frac{4}{\sin x}+\frac{1}{1-\sin x}=a$ has at least one solution in the interval $\left(0,\frac{\pi}{2}\right)$ is :

(1) 8
(2) 9
(3) 4
(4) 3

**15.** A spherical baloon is pumped at the rate of 10 inch$^3$/min. If radius of baloon is 15 inch, then the rate of increase of its radius is :

(1) $\frac{1}{30\pi}$ inch/min
(2) $\frac{1}{120\pi}$ inch/min
(3) $\frac{1}{60\pi}$ inch/min
(4) $\frac{1}{90\pi}$ inch/min

**16.** The order of the differential equation whose general solution is given by :

$y = (c_1 + c_2)\cos(x + c_3) - c_4 . e^{x + c_5}$, where $c_1$, $c_2$, $c_3$, $c_4$ and $c_5$ are arbitrary constant, is :

(1) 5 (2) 4

(3) 3 (4) 2

**17.** The real value of $n$ for which the substitution $y = u^n$ will transform the differential equation $2x^4 y\frac{dy}{dx} + y^4 = 4x^6$ into a homogeneous equation is :

(1) $\frac{3}{2}$ (2) $\frac{5}{2}$ (3) $\frac{1}{2}$ (4) 1

**18.** The differential equation representing the family of the curves $y^2 = 2c\,(x + \sqrt{c})$, where $c$ is a positive parameter, is of :

(1) order 2, degree 2 (2) order 1, degree 3

(3) order 3, degree 1 (4) None of these

**19.** The solution of the differential equation $\sin y\frac{dy}{dx} = \cos y(1 - x\cos y)$ is :

(1) $\sec y = x - 1 - ce^x$ (2) $\sec y = x + e^x + c$

(3) $\sec y = x - 1 + ce^x$ (4) $\sec y = x + 1 + ce^x$

**20.** $\int\frac{3 + 2\cos x}{(2 + 3\cos x)^2}dx$ is equal to :

(1) $\left(\frac{2\cos x}{2 + 3\sin x}\right) + c$ (2) $\left(\frac{2\cos x}{2 + 3\cos x}\right) + c$

(3) $\left(\frac{\sin x}{2 + 3\cos x}\right) + c$ (4) $\left(\frac{\sin x}{3 + 2\cos x}\right) + c$

**21.** If λ is a non-real cube root of –2, then the value of $\begin{vmatrix} 1 & 2\lambda & 1 \\ \lambda^2 & 1 & 3\lambda^2 \\ 2 & 2\lambda & 1 \end{vmatrix}$ is equal to :

(1) –10

(2) –13

(3) –11

(4) –12

**22.** If $z = \begin{vmatrix} 3+2i & 5-i & 7-3i \\ i & 2i & -3i \\ 3-2i & 5+i & 7+3i \end{vmatrix}$, where $i = \sqrt{-1}$, then $z$ is :

(1) Purely Real

(2) Purely Imaginary

(3) 1

(4) 0

**23.** The value of the determinant $\begin{vmatrix} 1 & e^{i\pi/3} & e^{i\pi/4} \\ e^{-i\pi/3} & 1 & e^{2i\pi/3} \\ e^{-i\pi/4} & e^{-2i\pi/3} & 1 \end{vmatrix}$, where $i = \sqrt{-1}$ is :

(1) $2+\sqrt{2}$

(2) $2-\sqrt{3}$

(3) $2+\sqrt{3}$

(4) $-(2+\sqrt{2})$

**24.** If $A$ is a skew-symmetric matrix, then trace of $A$ is :

(1) –1

(2) 1

(3) 0

(4) $i$

**25.** If $A = \begin{bmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(x)$, then $A^{-1}$ is equal to :

(1) $f(x)$

(2) $f(-x)$

(3) $-f(x)$

(4) 0

**26.** If $A^2 + A - I = 0$, then $A^{-1}$ is equal to :

(1) A–I

(2) A + I

(3) I

(4) 0

**27.** If $x^y \cdot y^x = 16$, then $\frac{dy}{dx}$ at (2, 2) is :

(1) 0

(2) 1

(3) –1

(4) $\frac{1}{2}$

**28.** If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx}$ is equal to :

(1) 1

(2) –1

(3) 0

(4) $\frac{1}{2}$

**29.** If $y = \tan^{-1}\left[\frac{\log_e(e/x^2)}{\log_e(ex^2)}\right] + \tan^{-1}\left[\frac{3+2\log_e x}{1-6\log_e x}\right]$, then $\frac{d^2y}{dx^2}$ is :

(1) –1

(2) 1

(3) ∞

(4) 0

**30.** The locus of all points on the curve $y^2 = 4a\left[x + a\sin\left(\frac{x}{a}\right)\right]$ at which the tangent is parallel to $x$-axis is :

(1) Ellipse

(2) Hyperbola

(3) Parabola

(4) Circle

**31.** In a city 20 per cent of the population travels by car, 50 per cent travels by bus and 10 per cent travels by both car and bus. Then persons travelling by car or bus is :

(1) 40 per cent (2) 60 per cent

(3) 70 per cent (4) 80 per cent

**32.** Let $n(U) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$, then $n(A^C \cap B^C)$ is :

(1) 600 (2) 400

(3) 200 (4) 300

**33.** If A and B are two sets, then $A \cup B = A \cap B$ iff :

(1) $A \subseteq B$ (2) $B \subseteq A$

(3) $A = B$ (4) None of these

**34.** The Relation $R$ in $N$ defined by ${}_aR_b \Leftrightarrow a^2 - 4ab + 3b^2 = 0$, $(a, b \in N)$ is :

(1) Reflexive (2) Symmetric

(3) Transitive (4) None of these

**35.** If $0 < a < b$, then $\lim_{n\to\infty}(b^n + a^n)^{1/n}$ is equal to :

(1) $e$ (2) $b$

(3) $a$ (4) None of these

**36.** The set of all points, where $f(x) = 3\sqrt{x^2\,|x|} - |x| - 1$ is not differentiable is :

(1) $\{0\}$ (2) $\{-1, 0, 1\}$

(3) $\{0, 1\}$ (4) None of these

**37.** The points of discontinuity of the function $f(x) = \lim \frac{(2\sin x)^{2n}}{3^n - (2\cos x)^{2n}}$ are given by :

(1) $r\pi + \frac{\pi}{12}, r \in I$

(2) $r\pi + \frac{\pi}{3}, r \in I$

(3) $r\pi \pm \frac{\pi}{6}, r \in I$

(4) None of these

**38.** The negation of $p \to q$ is :

(1) $p \wedge \sim q$

(2) $q \to p$

(3) $q' \to p$

(4) $p \to q'$

**39.** The disjunction $p \vee q$ is false only when :

(1) $p$ is false

(2) $q$ is false

(3) $p$ and $q$ are both false

(4) None of these

**40.** If $A = \{1, 3, 5, 7\}$, $B = \{2, 5\}$, then the number of relations from A to B is :

(1) 256 (2) 128 (3) 64 (4) 32

**41.** Radius of the largest circle which passes through the focus of the parabola $y^2 = 4x$ and contained in it, is :

(1) 2

(2) 4

(3) 8

(4) 5

**42.** The distances from the foci of $P(a, b)$ on the ellipse $\frac{x^2}{9} + \frac{y^2}{25} = 1$ are :

(1) $4 \pm \frac{5}{4}b$

(2) $5 \pm \frac{4}{5}a$

(3) $5 \pm \frac{4}{5}b$

(4) None of these

**43.** Two conics $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ and $x^2 = -\frac{a}{b}y$ intersect, if :

(1) $a^2 < \frac{1}{4}$

(2) $a^2 > \frac{1}{4}$

(3) $a^2 = \frac{1}{4}$

(4) None of these

**44.** The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$, and having its centre (0, 3) is :

(1) 3

(2) $\sqrt{3}$

(3) 2

(4) 4

**45.** The locus of the point, the sum of squares of whose distance, from the planes $x - z = 0$, $x - 2y + z = 0$ and $x + y + z = 0$ is 36 is given by :

(1) $x^2 + y^2 + z^2 = 6$

(2) $x^{-2} + y^{-2} + z^{-2} = \frac{1}{36}$

(3) $x^2 + y^2 + z^2 = 36$

(4) $x^2 + y^2 + z^2 = 216$

**46.** The equation of the plane through the point (2, 5, –3) perpendicular to the planes $x + 2y + 2z = 1$ and $x - 2y + 3z = 4$ is :

(1) $3x - 4y + 2z = 20$

(2) $10x - y - 4z = 27$

(3) $3x + 4y - 2z = 20$

(4) $10x + y + 4z = 27$

**47.** A line makes angles α, β, γ, δ with the four diagonals of a cube. Then $\cos^2 \alpha + \cos^2 \beta + \cos^2 \gamma + \cos^2 \delta$ is :

(1) $\frac{4}{3}$ (2) $\frac{1}{3}$

(3) $\frac{2}{3}$ (4) $\frac{3}{4}$

**48.** The symmetric form of the equations of the line $x + y - z = 1, 2x - 3y + z = 2$ is :

(1) $\frac{x}{2} = \frac{y}{3} = \frac{z}{5}$ (2) $\frac{x}{2} = \frac{y}{3} = \frac{z-1}{5}$

(3) $\frac{x}{3} = \frac{y}{2} = \frac{z}{5}$ (4) $\frac{x-1}{2} = \frac{y}{3} = \frac{z}{5}$

**49.** If $A = \cos(\cos x) + \sin(\cos x)$, the least and greatest value of $A$ are :

(1) 0 and 2 (2) −1 and 1

(3) $-\sqrt{2}$ and $\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$ and $\sqrt{2}$

**50.** The least value of $\operatorname{cosec}^2 x + 25 \sec^2 x$ is :

(1) 38 (2) 36

(3) 34 (4) 32

**51.** If $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{a} + \vec{b}| = 5$, then $|\vec{a} - \vec{b}|$ is equal to :

(1) 5 (2) 4

(3) 2 (4) 1

**52.** If $(\vec{a}\times\vec{b})^2+(\vec{a}\,.\,\vec{b})^2=144$ and $|\vec{a}|=4$, then $|\vec{b}|$ is equal to :

(1) 4
(2) 3
(3) 1
(4) 2

**53.** Let $|\vec{a}|=1, |\vec{b}|=2, |\vec{c}|=3$ and $\vec{a}\perp(\vec{b}+\vec{c}), \vec{b}\perp(\vec{c}+\vec{a}), \vec{c}\perp(\vec{a}+\vec{b})$. Then $|\vec{a}+\vec{b}+\vec{c}|$ is :

(1) $\sqrt{10}$
(2) $\sqrt{12}$
(3) $\sqrt{8}$
(4) $\sqrt{14}$

**54.** Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a}\neq 0$ and $\vec{a}\times\vec{b}=2\,\vec{a}\times\vec{c}, |\vec{a}|=|\vec{c}|=1, |\vec{b}|=4$ and $|\vec{b}\times\vec{c}|=\sqrt{15}$. If $\vec{b}-2\vec{c}=\lambda\vec{a}$, then $\lambda$ is equal to :

(1) 1
(2) 3
(3) $-4$
(4) 2

**55.** The point on the line $\frac{x-2}{1}=\frac{y+3}{-2}=\frac{z+5}{-2}$ at a distance of 6 from the point (2, –3, –5) is :

(1) (4, –7, –9)
(2) (4, 7, 9)
(3) (3, –5, –3)
(4) (–3, 5, 3)

**56.** The coordinates of the centroid of the triangle ABC, where A, B, C are the points of intersection of the plane $6x+3y-2z=18$ with the coordinate axes are :

(1) (–1, 2, 3)
(2) (1, 2, –3)
(3) (–1, –2, –3)
(4) (1, –2, 3)

**57.** The points (8, –5, 6), (11, 1, 8), (9, 4, 2) and (6, –2, 0) are the vertices of a :

(1) Rhombus
(2) Rectangle
(3) Parallelogram
(4) Square

**58.** The plane containing the two lines $\frac{x-3}{1}=\frac{y-2}{4}=\frac{z-1}{5}$ and $\frac{x-2}{1}=\frac{y+3}{-4}=\frac{z+1}{5}$ is $11x+my+nz=28$, where :

(1) $m=-1, n=3$ (2) $m=-1, n=-3$

(3) $m=1, n=3$ (4) $m=1, n=-3$

**59.** If $z=(\lambda+3)+i\sqrt{(5-\lambda^2)}$ ; then the locus of $z$ is :

(1) a Straight line (2) a Parabola

(3) a Circle (4) a Hyperbola

**60.** If $8iz^3+12z^2-18z+27i=0$, (where $i=\sqrt{-1}$), then :

(1) $|z|=\frac{3}{2}$ (2) $|z|=\frac{2}{3}$

(3) $|z|=1$ (4) $|z|=\frac{3}{4}$

**61.** If $\sin\theta_1+\sin\theta_2+\sin\theta_3=3$, then $\cos\theta_1+\cos\theta_2+\cos\theta_3$ is equal to :

(1) 0 (2) 1

(3) 2 (4) 3

**62.** If $\tan x\tan y=a$ and $x+y=\frac{\pi}{6}$, then $\tan x$ and $\tan y$ satisfy the equation :

(1) $x^2-\sqrt{3}\,(1-a)x+a=0$

(2) $x^2+\sqrt{3}\,(1-a)x+a=0$

(3) $\sqrt{3}x^2+(1+a)x-a\sqrt{3}=0$

(4) $\sqrt{3}x^2-(1-a)x+a\sqrt{3}=0$

**63.** Fifteen coupons are numbered 1, 2, 3, ........, 15 respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is atmost 9, is :

(1) $\left(\frac{1}{15}\right)^7$ (2) $\left(\frac{8}{15}\right)^7$

(3) $\left(\frac{3}{5}\right)^7$ (4) $\left(\frac{4}{5}\right)^7$

**64.** The probability of guessing correctly at least 8 out of 10 answers on a true-false examination, is :

(1) $\frac{7}{128}$ (2) $\frac{7}{64}$

(3) $\frac{45}{1024}$ (4) $\frac{175}{1024}$

**65.** A fair die is thrown untill a score of less than five points is obtained. The probability of obtaining less than three points on the last throw is :

(1) $\frac{3}{4}$ (2) $\frac{1}{2}$

(3) $\frac{4}{5}$ (4) $\frac{5}{6}$

**66.** Two players A and B throw a die alternately for a prize of Rs. 11, which is to be won by a player who first throws a six. If A starts the game, their respective expectations are :

(1) Rs. 7; Rs. 4 (2) Rs. 8; Rs. 3

(3) Rs. 6; Rs. 5 (4) Rs. 6; Rs. 5

**67.** The mean of 8 observations is 9 and their variance is 9.25. If six of the observations are 6, 7, 10, 12, 12 and 13, then the remaining two observations are :

(1) 8, 6 (2) 8, 5

(3) 8, 4 (4) 8, 3

**68.** The frequencies of values 0, 1, 2, ........., $n$ of a variable are $q^n$, ${}^nc_1\, q^{n-1}\, p^1$, ${}^nc_2\, q^{n-2}\, p^2$, ........, $p^n$, where $p + q = 1$. The mean is :

(1) $n + p$ (2) $np$

(3) $\frac{n}{p}$ (4) $n - p$

**69.** Which of the following is ***not*** a merit of Mean Deviation ?

(1) It is unduly affected by the presence of extreme items

(2) It is based on all the items

(3) It can be calculated by using any average

(4) None of these

**70.** The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.

(1) 100 (2) 50

(3) 40 (4) 20

**71.** The range of the function $f(x) = 3|\sin x| - 2\,|\cos x|$ is :

(1) $[-2, \sqrt{13}\,]$ (2) $[-2, 3]$

(3) $[-3, 2]$ (4) $[3, \sqrt{13}\,]$

**72.** Let $f : R \rightarrow \left[0, \frac{\pi}{2}\right)$ be a function defined by $f(x) = \tan^{-1}(x^2 + x + a)$. If $f$ is onto, then $a$ equals :

(1) $\frac{1}{4}$ (2) $\frac{1}{2}$

(3) 1 (4) 0

**73.** If the domain of $f(x)$ is $(0, 1)$, then the domain of $f(e^x) + f(\ln |x|)$ is :

(1) $(-1, e)$ (2) $(-e, -1)$

(3) $(-e, 1)$ (4) $(1, e)$

**74.** Let $f : R \to R$ be a function defined by $f(x) = \frac{x^2 + 2x + 5}{x^2 + x + 1}$. The function $f(x)$ is :

(1) one-one and into (2) one-one and onto

(3) many one and onto (4) many one and into

**75.** The probability that at least one of the events A and B occurs is $\frac{3}{5}$. If A and B occur simultaneously with probability $\frac{1}{5}$, then $P(\overline{A}) + P(\overline{B})$ is :

(1) $\frac{2}{5}$ (2) $\frac{4}{5}$ (3) $\frac{6}{5}$ (4) $\frac{7}{5}$

**76.** A bag contains 16 coins of which two are counterfeit with heads on both sides. The rest are fair coins. One is selected at random from the bag and tossed. The probability of getting a head is :

(1) $\frac{9}{16}$ (2) $\frac{11}{16}$

(3) $\frac{13}{16}$ (4) $\frac{15}{16}$

**77.** An urn contains five balls. Two balls are drawn and are found to be white. The probability that all the balls are white is :

(1) $\frac{2}{5}$ (2) $\frac{1}{2}$

(3) $\frac{3}{5}$ (4) $\frac{1}{3}$

**78.** A box contains 6 nails and 10 nuts. Half of the nails and half of the nuts are rusted. If one item is chosen at random, the probability that it is rusted or is a nails is :

(1) $\frac{3}{16}$ (2) $\frac{5}{16}$

(3) $\frac{9}{16}$ (4) $\frac{11}{16}$

**79.** The maximum value of $P = 6x + 8y$ subject to constraints $2x + y \leq 30$, $x + 2y \leq 24$, $x \geq 0, y \geq 0$ is :

(1) 90 (2) 96

(3) 120 (4) 240

**80.** The number of proper subsets of the set $\{1, 2, 3\}$ is :

(1) 6 (2) 7

(3) 8 (4) 9

**81.** Let $f(x)$ be a differential function for all $x$. If $f(1) = -2$ and $f'(x) \geq 2$ for all $x$ in $[1, 6]$, then minimum value of $f(6)$ is equal to :

(1) 4 (2) 6

(3) 2 (4) 8

**82.** The minimum value of $\left(1+\frac{1}{\sin^n \alpha}\right)\left(1+\frac{1}{\cos^n \alpha}\right)$ is equal to :

(1) 1 (2) $(1 + 2^{n/2})^2$

(3) $-1$ (4) $\frac{1+2^{n/2}}{1-2^{n/2}}$

**83.** If $\int f(x)\cos x\,dx = \frac{1}{2}\{f(x)\}^2 + c$, then $f(x)$ is given by :

(1) $\sin x + c$ (2) $\cos x + c$

(3) $x + c$ (4) $c$

**84.** $\int (x - {}^{11}c_1 x^2 + {}^{11}c_2 x^3 - {}^{11}c_3 x^4 + \ldots\ldots\ldots\ldots - {}^{11}c_{11} x^{12})\,dx$ is equal to :

(1) $\frac{(1-x)^{13}}{13} - \frac{(1-x)^{12}}{12} + c$ (2) $\frac{(1-x)^{12}}{12} + \frac{(1-x)^{13}}{13} + c$

(3) $\frac{(1-x)^{13}}{12} + \frac{(1-x)^{12}}{13} + c$ (4) None of these

**85.** If $\int_0^1 \frac{e^t}{t+1}\,dt = a$, then $\int_{b-1}^{b} \frac{e^{-t}}{t-b-1}\,dt$ is equal to :

(1) $ae^{-b}$ (2) $ae^{b}$

(3) $-ae^{-b}$ (4) $-be^{-a}$

**86.** The value of $\int_0^2 [x^2 - x + 1]\,dx$ (where [·] denotes the greatest integer function) is given by :

(1) $\frac{7-\sqrt{5}}{2}$ (2) $\frac{8-\sqrt{5}}{2}$

(3) $\frac{6-\sqrt{5}}{2}$ (4) $\frac{5-\sqrt{5}}{2}$

**87.** The value of the integral $\int_{1/e}^{e} |\ln x|\, dx$ is :

(1) $1-\frac{1}{e}$

(2) $2\left(1-\frac{1}{e}\right)$

(3) $\frac{1}{e}-1$

(4) $(e-1)^{-1}$

**88.** The area bounded by $y=\frac{\sin x}{x}$, $x$ – axis and the ordinates $x=0, x=\frac{\pi}{4}$ is :

(1) $=\frac{\pi}{4}$

(2) $>\frac{\pi}{4}$

(3) $<\frac{\pi}{4}$

(4) 0

**89.** The area between the curve $y=-x^2+2x^4$, the $x$-axis and the ordinates of two minima of the curve is :

(1) $\frac{7}{120}$ sq unit

(2) $\frac{9}{120}$ sq unit

(3) $\frac{11}{120}$ sq unit

(4) $\frac{13}{120}$ sq unit

**90.** The value of $f(0)$, so that the function $f(x)=\frac{1-\cos(1-\cos x)}{x^4}$ is continuous everywhere is :

(1) $\frac{1}{4}$

(2) $\frac{1}{8}$

(3) $\frac{1}{2}$

(4) None of these

**91.** The term independent of $x$ in the expansion of $[(t^{-1}-1)\,x+(t^{-1}+1)^{-1}\,x^{-1}]^{8}$ is :

(1) $70\left(\frac{1-t}{1+t}\right)^{4}$ (2) $70\left(\frac{1+t}{1-t}\right)^{4}$

(3) $56\left(\frac{1+t}{1-t}\right)^{3}$ (4) $56\left(\frac{1-t}{1+t}\right)^{3}$

**92.** In the expansion of $(1+x)^{43}$, the coefficients of the $(2r+1)$th and $(r+2)$th terms are equal, then the value of $r$ is :

(1) 16 (2) 15 (3) 14 (4) 13

**93.** An infinite G. P. has first term $x$ and sum 5, then $x$ belongs to :

(1) $x<-10$ (2) $0<x<10$

(3) $-10<x<0$ (4) $x>0$

**94.** In the quadratic equation $ax^{2}+bx+c=0$, if $\Delta=b^{2}-4ac$ and $\alpha+\beta$, $\alpha^{2}+\beta^{2}$, $\alpha^{3}+\beta^{3}$ are in G.P., where $\alpha$, $\beta$ are the roots of $ax^{2}+bx+c=0$, then :

(1) $\Delta \neq 0$ (2) $b\Delta=0$

(3) $\Delta=0$ (4) $c\Delta=0$

**95.** If the sum of first $n$ positive integers is $\frac{1}{5}$ times the sum of their squares, then $n$ equals :

(1) 7 (2) 8 (3) 5 (4) 6

**96.** If $\frac{a+bx}{a-bx}=\frac{b+cx}{b-cx}=\frac{c+dx}{c-dx}\ (x \neq 0)$, then $a, b, c, d$ are in :

(1) AP (2) GP

(3) HP (4) None of these

**97.** The line $3x - 4y + 7 = 0$ is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point $(-1, 1)$. The equation of the line in its new position is :

(1) $7y - x + 6 = 0$ (2) $7y - x - 6 = 0$

(3) $7y + x - 6 = 0$ (4) $7y + x + 6 = 0$

**98.** The diagonals of the parallelogram whose sides are $lx + my + n = 0$, $lx + my + n' = 0$, $mx + ly + n = 0$, $mx + ly + n' = 0$ include an angle :

(1) $\frac{\pi}{6}$ (2) $\frac{\pi}{3}$

(3) $\frac{\pi}{4}$ (4) $\frac{\pi}{2}$

**99.** If an equilateral triangle has one side given by $x + y - 2 = 0$ and its centroid is at the origin, then one vertex of the triangle is :

(1) $(-2, -2)$ (2) $(-2, 2)$

(3) $(2, -2)$ (4) $(-1, -1)$

**100.** If each of the points $(x_1, 4)$, $(-2, y_1)$ lies on the line joining the points $(2, -1)$, $(5, -3)$, then the point $P(x_1, y_1)$ lies on the line :

(1) $2x + 6y + 1 = 0$ (2) $2x + 3y - 6 = 0$

(3) $6(x + y) - 23 = 0$ (4) $6(x + y) - 25 = 0$

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Total No. of Printed Pages : 21

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**D**

**SET-X**

# PG-EE-2022

## SUBJECT : Mathematics Hons. (Five Year)

Sr. No. ............ 10008

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_______________ (in words) ______________________________

Name __________________________ Father's Name__________________________

Mother's Name_______________________ Date of Examination_______________________

________________________ ________________________

(Signature of the Candidate) (Signature of the Invigilator)

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### CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code will be got uploaded on the University website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examinations in writing/through E.Mail (coe@mdurohtak.ac.in) within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Let $f(x)$ be a differential function for all $x$. If $f(1) = -2$ and $f'(x) \geq 2$ for all $x$ in $[1, 6]$, then minimum value of $f(6)$ is equal to :

(1) 4 (2) 6

(3) 2 (4) 8

2. The minimum value of $\left(1+\frac{1}{\sin^n \alpha}\right)\left(1+\frac{1}{\cos^n \alpha}\right)$ is equal to :

(1) 1 (2) $(1+2^{n/2})^2$

(3) $-1$ (4) $\frac{1+2^{n/2}}{1-2^{n/2}}$

3. If $\int f(x)\cos x\, dx = \frac{1}{2}\{f(x)\}^2 + c$, then $f(x)$ is given by :

(1) $\sin x + c$ (2) $\cos x + c$

(3) $x + c$ (4) $c$

4. $\int (x - {}^{11}c_1 x^2 + {}^{11}c_2 x^3 - {}^{11}c_3 x^4 + \ldots\ldots\ldots\ldots - {}^{11}c_{11} x^{12})\, dx$ is equal to :

(1) $\frac{(1-x)^{13}}{13} - \frac{(1-x)^{12}}{12} + c$ (2) $\frac{(1-x)^{12}}{12} + \frac{(1-x)^{13}}{13} + c$

(3) $\frac{(1-x)^{13}}{12} + \frac{(1-x)^{12}}{13} + c$ (4) None of these

5. If $\int_0^1 \frac{e^t}{t+1} dt = a$, then $\int_{b-1}^{b} \frac{e^{-t}}{t-b-1} dt$ is equal to :

(1) $ae^{-b}$ (2) $ae^{b}$

(3) $-ae^{-b}$ (4) $-be^{-a}$

**6.** The value of $\int_0^2 [x^2 - x + 1]dx$ (where $[\cdot]$ denotes the greatest integer function) is given by :

(1) $\frac{7-\sqrt{5}}{2}$ (2) $\frac{8-\sqrt{5}}{2}$

(3) $\frac{6-\sqrt{5}}{2}$ (4) $\frac{5-\sqrt{5}}{2}$

**7.** The value of the integral $\int_{1/e}^{e} |\ln x| \, dx$ is :

(1) $1-\frac{1}{e}$ (2) $2\left(1-\frac{1}{e}\right)$

(3) $\frac{1}{e}-1$ (4) $(e-1)^{-1}$

**8.** The area bounded by $y = \frac{\sin x}{x}$, $x$ – axis and the ordinates $x = 0, x = \frac{\pi}{4}$ is :

(1) $= \frac{\pi}{4}$ (2) $> \frac{\pi}{4}$

(3) $< \frac{\pi}{4}$ (4) 0

**9.** The area between the curve $y = -x^2 + 2x^4$, the $x$-axis and the ordinates of two minima of the curve is :

(1) $\frac{7}{120}$ sq unit (2) $\frac{9}{120}$ sq unit

(3) $\frac{11}{120}$ sq unit (4) $\frac{13}{120}$ sq unit

**10.** The value of $f(0)$, so that the function $f(x)=\frac{1-\cos(1-\cos x)}{x^4}$ is continuous everywhere is :

(1) $\frac{1}{4}$ (2) $\frac{1}{8}$

(3) $\frac{1}{2}$ (4) None of these

**11.** In a city 20 per cent of the population travels by car, 50 per cent travels by bus and 10 per cent travels by both car and bus. Then persons travelling by car or bus is :

(1) 40 per cent (2) 60 per cent

(3) 70 per cent (4) 80 per cent

**12.** Let $n(U) = 700$, $n(A) = 200$, $n(B) = 300$ and $n(A \cap B) = 100$, then $n(A^C \cap B^C)$ is :

(1) 600 (2) 400

(3) 200 (4) 300

**13.** If A and B are two sets, then $A \cup B = A \cap B$ iff :

(1) $A \subseteq B$ (2) $B \subseteq A$

(3) $A = B$ (4) None of these

**14.** The Relation $R$ in $N$ defined by ${}_aR_b \Leftrightarrow a^2 - 4ab + 3b^2 = 0$, $(a, b \in N)$ is :

(1) Reflexive (2) Symmetric

(3) Transitive (4) None of these

**15.** If $0 < a < b$, then $\lim_{n\to\infty}(b^n + a^n)^{1/n}$ is equal to :

(1) $e$ (2) $b$

(3) $a$ (4) None of these

**16.** The set of all points, where $f(x) = 3\sqrt{x^2\,|x|} - |x| - 1$ is not differentiable is :

(1) $\{0\}$ (2) $\{-1, 0, 1\}$

(3) $\{0, 1\}$ (4) None of these

**17.** The points of discontinuity of the function $f(x) = \lim \dfrac{(2\sin x)^{2n}}{3^n - (2\cos x)^{2n}}$ are given by :

(1) $r\pi + \dfrac{\pi}{12}, r \in I$ (2) $r\pi + \dfrac{\pi}{3}, r \in I$

(3) $r\pi \pm \dfrac{\pi}{6}, r \in I$ (4) None of these

**18.** The negation of $p \to q$ is :

(1) $p \wedge \sim q$ (2) $q \to p$

(3) $q' \to p$ (4) $p \to q'$

**19.** The disjunction $p \vee q$ is false only when :

(1) $p$ is false (2) $q$ is false

(3) $p$ and $q$ are both false (4) None of these

**20.** If $A = \{1, 3, 5, 7\}$, $B = \{2, 5\}$, then the number of relations from A to B is :

(1) 256 (2) 128

(3) 64 (4) 32

**21.** If $\sin\theta_1 + \sin\theta_2 + \sin\theta_3 = 3$, then $\cos\theta_1 + \cos\theta_2 + \cos\theta_3$ is equal to :

(1) 0
(2) 1
(3) 2
(4) 3

**22.** If $\tan x \tan y = a$ and $x + y = \frac{\pi}{6}$, then $\tan x$ and $\tan y$ satisfy the equation :

(1) $x^2 - \sqrt{3}\,(1 - a)\,x + a = 0$
(2) $x^2 + \sqrt{3}\,(1 - a)\,x + a = 0$
(3) $\sqrt{3}x^2 + (1 + a)\,x - a\sqrt{3} = 0$
(4) $\sqrt{3}x^2 - (1 - a)\,x + a\sqrt{3} = 0$

**23.** Fifteen coupons are numbered 1, 2, 3, ........, 15 respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is atmost 9, is :

(1) $\left(\frac{1}{15}\right)^7$
(2) $\left(\frac{8}{15}\right)^7$
(3) $\left(\frac{3}{5}\right)^7$
(4) $\left(\frac{4}{5}\right)^7$

**24.** The probability of guessing correctly at least 8 out of 10 answers on a true-false examination, is :

(1) $\frac{7}{128}$
(2) $\frac{7}{64}$
(3) $\frac{45}{1024}$
(4) $\frac{175}{1024}$

**25.** A fair die is thrown untill a score of less than five points is obtained. The probability of obtaining less than three points on the last throw is :

(1) $\frac{3}{4}$
(2) $\frac{1}{2}$
(3) $\frac{4}{5}$
(4) $\frac{5}{6}$

**26.** Two players A and B throw a die alternately for a prize of Rs. 11, which is to be won by a player who first throws a six. If A starts the game, their respective expectations are :

(1) Rs. 7; Rs. 4

(2) Rs. 8; Rs. 3

(3) Rs. 6; Rs. 5

(4) Rs. 6; Rs. 5

**27.** The mean of 8 observations is 9 and their variance is 9.25. If six of the observations are 6, 7, 10, 12, 12 and 13, then the remaining two observations are :

(1) 8, 6

(2) 8, 5

(3) 8, 4

(4) 8, 3

**28.** The frequencies of values 0, 1, 2, ........., $n$ of a variable are $q^n$, ${}^nc_1\, q^{n-1}\, p^1$, ${}^nc_2\, q^{n-2}\, p^2$, ........, $p^n$, where $p + q = 1$. The mean is :

(1) $n + p$

(2) $np$

(3) $\frac{n}{p}$

(4) $n - p$

**29.** Which of the following is ***not*** a merit of Mean Deviation ?

(1) It is unduly affected by the presence of extreme items

(2) It is based on all the items

(3) It can be calculated by using any average

(4) None of these

**30.** The variance of 20 observations is 5. If each observation is multiplied by 2, find the new variance of the resulting observations.

(1) 100

(2) 50

(3) 40

(4) 20

**31.** The term independent of $x$ in the expansion of $[(t^{-1}-1)\,x+(t^{-1}+1)^{-1}\,x^{-1}]^8$ is :

(1) $70\left(\frac{1-t}{1+t}\right)^4$ (2) $70\left(\frac{1+t}{1-t}\right)^4$

(3) $56\left(\frac{1+t}{1-t}\right)^3$ (4) $56\left(\frac{1-t}{1+t}\right)^3$

**32.** In the expansion of $(1+x)^{43}$, the coefficients of the $(2r+1)$th and $(r+2)$th terms are equal, then the value of $r$ is :

(1) 16 (2) 15 (3) 14 (4) 13

**33.** An infinite G. P. has first term $x$ and sum 5, then $x$ belongs to :

(1) $x<-10$ (2) $0<x<10$

(3) $-10<x<0$ (4) $x>0$

**34.** In the quadratic equation $ax^2+bx+c=0$, if $\Delta=b^2-4ac$ and $\alpha+\beta$, $\alpha^2+\beta^2$, $\alpha^3+\beta^3$ are in G.P., where $\alpha$, $\beta$ are the roots of $ax^2+bx+c=0$, then :

(1) $\Delta\neq 0$ (2) $b\Delta=0$

(3) $\Delta=0$ (4) $c\Delta=0$

**35.** If the sum of first $n$ positive integers is $\frac{1}{5}$ times the sum of their squares, then $n$ equals :

(1) 7 (2) 8 (3) 5 (4) 6

**36.** If $\frac{a+bx}{a-bx}=\frac{b+cx}{b-cx}=\frac{c+dx}{c-dx}\ (x\neq 0)$, then $a$, $b$, $c$, $d$ are in :

(1) AP (2) GP

(3) HP (4) None of these

**37.** The line $3x - 4y + 7 = 0$ is rotated through an angle $\frac{\pi}{4}$ in the clockwise direction about the point $(-1, 1)$. The equation of the line in its new position is :

(1) $7y - x + 6 = 0$

(2) $7y - x - 6 = 0$

(3) $7y + x - 6 = 0$

(4) $7y + x + 6 = 0$

**38.** The diagonals of the parallelogram whose sides are $lx + my + n = 0$, $lx + my + n' = 0$, $mx + ly + n = 0$, $mx + ly + n' = 0$ include an angle :

(1) $\frac{\pi}{6}$

(2) $\frac{\pi}{3}$

(3) $\frac{\pi}{4}$

(4) $\frac{\pi}{2}$

**39.** If an equilateral triangle has one side given by $x + y - 2 = 0$ and its centroid is at the origin, then one vertex of the triangle is :

(1) $(-2, -2)$

(2) $(-2, 2)$

(3) $(2, -2)$

(4) $(-1, -1)$

**40.** If each of the points $(x_1, 4)$, $(-2, y_1)$ lies on the line joining the points $(2, -1)$, $(5, -3)$, then the point $P(x_1, y_1)$ lies on the line :

(1) $2x + 6y + 1 = 0$

(2) $2x + 3y - 6 = 0$

(3) $6(x + y) - 23 = 0$

(4) $6(x + y) - 25 = 0$

**41.** If $|\vec{a}| = 3, |\vec{b}| = 4$ and $|\vec{a} + \vec{b}| = 5$, then $|\vec{a} - \vec{b}|$ is equal to :

(1) 5

(2) 4

(3) 2

(4) 1

**42.** If $(\vec{a}\times\vec{b})^2+(\vec{a}\,.\,\vec{b})^2=144$ and $|\vec{a}|=4$, then $|\vec{b}|$ is equal to :

(1) 4

(2) 3

(3) 1

(4) 2

**43.** Let $|\vec{a}|=1, |\vec{b}|=2, |\vec{c}|=3$ and $\vec{a}\perp(\vec{b}+\vec{c}), \vec{b}\perp(\vec{c}+\vec{a}), \vec{c}\perp(\vec{a}+\vec{b})$. Then $|\vec{a}+\vec{b}+\vec{c}|$ is :

(1) $\sqrt{10}$

(2) $\sqrt{12}$

(3) $\sqrt{8}$

(4) $\sqrt{14}$

**44.** Let $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a}\neq 0$ and $\vec{a}\times\vec{b}=2\,\vec{a}\times\vec{c}, |\vec{a}|=|\vec{c}|=1, |\vec{b}|=4$ and $|\vec{b}\times\vec{c}|=\sqrt{15}$. If $\vec{b}-2\vec{c}=\lambda\vec{a}$, then $\lambda$ is equal to :

(1) 1

(2) 3

(3) $-4$

(4) 2

**45.** The point on the line $\dfrac{x-2}{1}=\dfrac{y+3}{-2}=\dfrac{z+5}{-2}$ at a distance of 6 from the point $(2, -3, -5)$ is :

(1) $(4, -7, -9)$

(2) $(4, 7, 9)$

(3) $(3, -5, -3)$

(4) $(-3, 5, 3)$

**46.** The coordinates of the centroid of the triangle ABC, where A, B, C are the points of intersection of the plane $6x+3y-2z=18$ with the coordinate axes are :

(1) $(-1, 2, 3)$

(2) $(1, 2, -3)$

(3) $(-1, -2, -3)$

(4) $(1, -2, 3)$

**47.** The points $(8, -5, 6)$, $(11, 1, 8)$, $(9, 4, 2)$ and $(6, -2, 0)$ are the vertices of a :

(1) Rhombus

(2) Rectangle

(3) Parallelogram

(4) Square

**48.** The plane containing the two lines $\frac{x-3}{1}=\frac{y-2}{4}=\frac{z-1}{5}$ and $\frac{x-2}{1}=\frac{y+3}{-4}=\frac{z+1}{5}$ is $11x+my+nz=28$, where :

(1) $m=-1, n=3$ (2) $m=-1, n=-3$

(3) $m=1, n=3$ (4) $m=1, n=-3$

**49.** If $z=(\lambda+3)+i\sqrt{(5-\lambda^2)}$ ; then the locus of $z$ is :

(1) a Straight line (2) a Parabola

(3) a Circle (4) a Hyperbola

**50.** If $8iz^3+12z^2-18z+27i=0$, (where $i=\sqrt{-1}$), then :

(1) $|z|=\frac{3}{2}$ (2) $|z|=\frac{2}{3}$

(3) $|z|=1$ (4) $|z|=\frac{3}{4}$

**51.** The value of '$a$' for which $ax^2+\sin^{-1}(x^2-2x+2)+\cos^{-1}(x^2-2x+2)=0$ has a real solution, is :

(1) $\frac{2}{\pi}$ (2) $-\frac{2}{\pi}$

(3) $\frac{\pi}{2}$ (4) $-\frac{\pi}{2}$

**52.** If $\cos^{-1}x+\cos^{-1}y+\cos^{-1}z=3\pi$, then $xy+yz+zx$ is equal to :

(1) 0 (2) $-3$

(3) 3 (4) $-1$

**53.** The value of $\tan\left\{\left(\cos^{-1}\left(-\frac{2}{7}\right)-\frac{\pi}{2}\right)\right\}$ is :

(1) $\frac{2}{3\sqrt{5}}$ (2) $\frac{2}{\sqrt{3}}$

(3) $\frac{3}{\sqrt{5}}$ (4) $\frac{4}{\sqrt{5}}$

**54.** The least value of '$a$' for which $\frac{4}{\sin x}+\frac{1}{1-\sin x}=a$ has at least one solution in the interval $\left(0,\frac{\pi}{2}\right)$ is :

(1) 8 (2) 9

(3) 4 (4) 3

**55.** A spherical baloon is pumped at the rate of 10 inch$^3$/min. If radius of baloon is 15 inch, then the rate of increase of its radius is :

(1) $\frac{1}{30\pi}$ inch/min (2) $\frac{1}{120\pi}$ inch/min

(3) $\frac{1}{60\pi}$ inch/min (4) $\frac{1}{90\pi}$ inch/min

**56.** The order of the differential equation whose general solution is given by :

$y=(c_1+c_2)\cos(x+c_3)-c_4.\ e^{x+c_5}$, where $c_1$, $c_2$, $c_3$, $c_4$ and $c_5$ are arbitrary constant, is :

(1) 5 (2) 4

(3) 3 (4) 2

**57.** The real value of $n$ for which the substitution $y = u^n$ will transform the differential equation $2x^4 y\dfrac{dy}{dx} + y^4 = 4x^6$ into a homogeneous equation is :

(1) $\dfrac{3}{2}$

(2) $\dfrac{5}{2}$

(3) $\dfrac{1}{2}$

(4) 1

**58.** The differential equation representing the family of the curves $y^2 = 2c\,(x + \sqrt{c}\,)$, where $c$ is a positive parameter, is of :

(1) order 2, degree 2

(2) order 1, degree 3

(3) order 3, degree 1

(4) None of these

**59.** The solution of the differential equation $\sin y\dfrac{dy}{dx} = \cos y(1 - x\cos y)$ is :

(1) $\sec y = x - 1 - ce^x$

(2) $\sec y = x + e^x + c$

(3) $\sec y = x - 1 + ce^x$

(4) $\sec y = x + 1 + ce^x$

**60.** $\displaystyle\int \frac{3 + 2\cos x}{(2 + 3\cos x)^2}\,dx$ is equal to :

(1) $\left(\dfrac{2\cos x}{2 + 3\sin x}\right) + c$

(2) $\left(\dfrac{2\cos x}{2 + 3\cos x}\right) + c$

(3) $\left(\dfrac{\sin x}{2 + 3\cos x}\right) + c$

(4) $\left(\dfrac{\sin x}{3 + 2\cos x}\right) + c$

**61.** If $n$ is a positive integer but not a multiple of 3 and $z = -1 + i\sqrt{3}$, (where $i = \sqrt{-1}$), then $(z^{2n} + 2^n . z^n + 2^{2n})$ is equal to :

(1) $-1$

(2) 1

(3) $2^n$

(4) 0

**62.** The value of $\alpha$ for which the equation $(\alpha + 5) x^2 - (2\alpha + 1)x + (\alpha - 1) = 0$ has roots equal in magnitude but opposite in sign, is :

(1) $-5$

(2) $-\frac{1}{2}$

(3) $\frac{7}{4}$

(4) 1

**63.** Let $\alpha$, $\beta$ be the roots of the equation $(x - a) (x - b) = c$, $c \neq 0$. Then the roots of the equation $(x - \alpha) (x - \beta) + c = 0$ are :

(1) $a, c$

(2) $b, c$

(3) $a, b$

(4) $a + c, b + c$

**64.** If $\alpha$, $\beta$ are the roots of the equation $x^2 + x\sqrt{\alpha} + \beta = 0$, then the values of $\alpha$ and $\beta$ are :

(1) $\alpha = 1, \beta = -2$

(2) $\alpha = 1, \beta = -1$

(3) $\alpha = 2, \beta = 1$

(4) $\alpha = 2, \beta = -2$

**65.** The number of diagonals that can be drawn in an octagon is :

(1) 16

(2) 18

(3) 28

(4) 20

**66.** If $n$ is an integer between 0 and 21, then the minimum value of $\lfloor\underline{n}\cdot\lfloor\underline{21-n}$ is :

(1) $\lfloor\underline{20}$ (2) $\lfloor\underline{10}\cdot\lfloor\underline{11}$

(3) $\lfloor\underline{21}$ (4) $\dfrac{\lfloor\underline{11}}{\lfloor\underline{10}}$

**67.** The number of numbers less than 1000 that can be formed out of the digits 0, 1, 2, 4 and 5, no digit being repeated is :

(1) 69 (2) 130

(3) 68 (4) None of these

**68.** The number of six digit numbers that can be formed from the digits 1, 2, 3, 4, 5, 6 and 7, so that digits don't repeat and the terminal digits are even is :

(1) 720 (2) 72

(3) 288 (4) 144

**69.** The total number of terms in the expansion of $(x+a)^{100}+(x-a)^{100}$ after simplification is :

(1) 50 (2) 51

(3) 150 (4) 102

**70.** For a positive integer $n$, if the expansion of $(2x^{-1}+x^{2})^{n}$ has a term independent of $x$, then a possible value for $n$ is :

(1) 22 (2) 16

(3) 10 (4) 18

**71.** Radius of the largest circle which passes through the focus of the parabola $y^{2}=4x$ and contained in it, is :

(1) 2 (2) 4

(3) 8 (4) 5

**72.** The distances from the foci of $P(a, b)$ on the ellipse $\frac{x^2}{9}+\frac{y^2}{25}=1$ are :

(1) $4 \pm \frac{5}{4}b$

(2) $5 \pm \frac{4}{5}a$

(3) $5 \pm \frac{4}{5}b$

(4) None of these

**73.** Two conics $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ and $x^2=-\frac{a}{b}y$ intersect, if :

(1) $a^2 < \frac{1}{4}$

(2) $a^2 > \frac{1}{4}$

(3) $a^2 = \frac{1}{4}$

(4) None of these

**74.** The radius of the circle passing through the foci of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$, and having its centre (0, 3) is :

(1) 3

(2) $\sqrt{3}$

(3) 2

(4) 4

**75.** The locus of the point, the sum of squares of whose distance, from the planes $x-z=0$, $x-2y+z=0$ and $x+y+z=0$ is 36 is given by :

(1) $x^2+y^2+z^2=6$

(2) $x^{-2}+y^{-2}+z^{-2}=\frac{1}{36}$

(3) $x^2+y^2+z^2=36$

(4) $x^2+y^2+z^2=216$

**76.** The equation of the plane through the point (2, 5, –3) perpendicular to the planes $x+2y+2z=1$ and $x-2y+3z=4$ is :

(1) $3x-4y+2z=20$

(2) $10x-y-4z=27$

(3) $3x+4y-2z=20$

(4) $10x+y+4z=27$

**77.** A line makes angles α, β, γ, δ with the four diagonals of a cube. Then $\cos^2\alpha + \cos^2\beta + \cos^2\gamma + \cos^2\delta$ is :

(1) $\frac{4}{3}$ (2) $\frac{1}{3}$

(3) $\frac{2}{3}$ (4) $\frac{3}{4}$

**78.** The symmetric form of the equations of the line $x + y - z = 1$, $2x - 3y + z = 2$ is :

(1) $\frac{x}{2} = \frac{y}{3} = \frac{z}{5}$ (2) $\frac{x}{2} = \frac{y}{3} = \frac{z-1}{5}$

(3) $\frac{x}{3} = \frac{y}{2} = \frac{z}{5}$ (4) $\frac{x-1}{2} = \frac{y}{3} = \frac{z}{5}$

**79.** If $A = \cos(\cos x) + \sin(\cos x)$, the least and greatest value of $A$ are :

(1) 0 and 2 (2) –1 and 1

(3) $-\sqrt{2}$ and $\sqrt{2}$ (4) $\frac{1}{\sqrt{2}}$ and $\sqrt{2}$

**80.** The least value of $\operatorname{cosec}^2 x + 25 \sec^2 x$ is :

(1) 38 (2) 36

(3) 34 (4) 32

**81.** If λ is a non-real cube root of –2, then the value of $\begin{vmatrix} 1 & 2\lambda & 1 \\ \lambda^2 & 1 & 3\lambda^2 \\ 2 & 2\lambda & 1 \end{vmatrix}$ is equal to :

(1) –10 (2) –13

(3) –11 (4) –12

**82.** If $z = \begin{vmatrix} 3+2i & 5-i & 7-3i \\ i & 2i & -3i \\ 3-2i & 5+i & 7+3i \end{vmatrix}$, where $i = \sqrt{-1}$, then $z$ is :

(1) Purely Real

(2) Purely Imaginary

(3) 1

(4) 0

**83.** The value of the determinant $\begin{vmatrix} 1 & e^{i\pi/3} & e^{i\pi/4} \\ e^{-i\pi/3} & 1 & e^{2i\pi/3} \\ e^{-i\pi/4} & e^{-2i\pi/3} & 1 \end{vmatrix}$, where $i = \sqrt{-1}$ is :

(1) $2+\sqrt{2}$

(2) $2-\sqrt{3}$

(3) $2+\sqrt{3}$

(4) $-(2+\sqrt{2})$

**84.** If $A$ is a skew-symmetric matrix, then trace of $A$ is :

(1) $-1$

(2) 1

(3) 0

(4) $i$

**85.** If $A = \begin{bmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(x)$, then $A^{-1}$ is equal to :

(1) $f(x)$

(2) $f(-x)$

(3) $-f(x)$

(4) 0

**86.** If $A^2 + A - I = 0$, then $A^{-1}$ is equal to :

(1) A–I

(2) A + I

(3) I

(4) 0

**87.** If $x^y \cdot y^x = 16$, then $\frac{dy}{dx}$ at (2, 2) is :

(1) 0
(2) 1
(3) $-1$
(4) $\frac{1}{2}$

**88.** If $x^2 + y^2 = t - \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $x^3 y \frac{dy}{dx}$ is equal to :

(1) 1
(2) $-1$
(3) 0
(4) $\frac{1}{2}$

**89.** If $y = \tan^{-1}\left[\frac{\log_e(e/x^2)}{\log_e(ex^2)}\right] + \tan^{-1}\left[\frac{3+2\log_e x}{1-6\log_e x}\right]$, then $\frac{d^2y}{dx^2}$ is :

(1) $-1$
(2) 1
(3) $\infty$
(4) 0

**90.** The locus of all points on the curve $y^2 = 4a\left[x + a\sin\left(\frac{x}{a}\right)\right]$ at which the tangent is parallel to $x$-axis is :

(1) Ellipse
(2) Hyperbola
(3) Parabola
(4) Circle

**91.** The range of the function $f(x) = 3|\sin x| - 2|\cos x|$ is :

(1) $[-2, \sqrt{13}]$
(2) $[-2, 3]$
(3) $[-3, 2]$
(4) $[3, \sqrt{13}]$

**92.** Let $f : R \to \left[0, \frac{\pi}{2}\right)$ be a function defined by $f(x) = \tan^{-1}(x^2 + x + a)$. If $f$ is onto, then a equals :

(1) $\frac{1}{4}$

(2) $\frac{1}{2}$

(3) 1

(4) 0

**93.** If the domain of $f(x)$ is (0, 1), then the domain of $f(e^x) + f(\ln|x|)$ is :

(1) $(-1, e)$

(2) $(-e, -1)$

(3) $(-e, 1)$

(4) $(1, e)$

**94.** Let $f : R \to R$ be a function defined by $f(x) = \frac{x^2+2x+5}{x^2+x+1}$. The function $f(x)$ is :

(1) one-one and into

(2) one-one and onto

(3) many one and onto

(4) many one and into

**95.** The probability that at least one of the events A and B occurs is $\frac{3}{5}$. If A and B occur simultaneously with probability $\frac{1}{5}$, then $P(\overline{A}) + P(\overline{B})$ is :

(1) $\frac{2}{5}$

(2) $\frac{4}{5}$

(3) $\frac{6}{5}$

(4) $\frac{7}{5}$

**96.** A bag contains 16 coins of which two are counterfeit with heads on both sides. The rest are fair coins. One is selected at random from the bag and tossed. The probability of getting a head is :

(1) $\frac{9}{16}$

(2) $\frac{11}{16}$

(3) $\frac{13}{16}$

(4) $\frac{15}{16}$

**97.** An urn contains five balls. Two balls are drawn and are found to be white. The probability that all the balls are white is :

(1) $\frac{2}{5}$ (2) $\frac{1}{2}$

(3) $\frac{3}{5}$ (4) $\frac{1}{3}$

**98.** A box contains 6 nails and 10 nuts. Half of the nails and half of the nuts are rusted. If one item is chosen at random, the probability that it is rusted or is a nails is :

(1) $\frac{3}{16}$ (2) $\frac{5}{16}$

(3) $\frac{9}{16}$ (4) $\frac{11}{16}$

**99.** The maximum value of $P = 6x + 8y$ subject to constraints $2x + y \leq 30$, $x + 2y \leq 24$, $x \geq 0, y \geq 0$ is :

(1) 90 (2) 96

(3) 120 (4) 240

**100.** The number of proper subsets of the set $\{1, 2, 3\}$ is :

(1) 6 (2) 7

(3) 8 (4) 9

## Answer key for 5 Year Integrated M. Sc. (Hons.) (Maths) for all Series/Codes

| Q. No. | A | B | C | D |
|---|---|---|---|---|
| 1 | 2 | 1 | 4 | 4 |
| 2 | 1 | 4 | 2 | 2 |
| 3 | 4 | 3 | 3 | 1 |
| 4 | 3 | 1 | 1 | 1 |
| 5 | 2 | 2 | 4 | 3 |
| 6 | 2 | 4 | 2 | 4 |
| 7 | 3 | 3 | 3 | 2 |
| 8 | 1 | 2 | 1 | 3 |
| 9 | 4 | 1 | 2 | 1 |
| 10 | 3 | 4 | 4 | 2 |
| 11 | 4 | 1 | 4 | 2 |
| 12 | 2 | 3 | 3 | 4 |
| 13 | 1 | 2 | 1 | 3 |
| 14 | 1 | 4 | 2 | 1 |
| 15 | 3 | 1 | 4 | 2 |
| 16 | 4 | 2 | 3 | 4 |
| 17 | 2 | 3 | 1 | 3 |
| 18 | 3 | 4 | 2 | 1 |
| 19 | 1 | 1 | 4 | 3 |
| 20 | 2 | 1 | 3 | 1 |
| 21 | 4 | 3 | 2 | 1 |
| 22 | 3 | 1 | 1 | 4 |
| 23 | 1 | 2 | 4 | 3 |
| 24 | 2 | 4 | 3 | 1 |
| 25 | 4 | 3 | 2 | 2 |
| 26 | 3 | 1 | 2 | 4 |
| 27 | 1 | 2 | 3 | 3 |
| 28 | 2 | 4 | 1 | 2 |
| 29 | 4 | 3 | 4 | 1 |
| 30 | 3 | 1 | 3 | 4 |
| 31 | 1 | 4 | 2 | 1 |
| 32 | 2 | 2 | 4 | 3 |
| 33 | 4 | 1 | 3 | 2 |
| 34 | 3 | 1 | 1 | 4 |
| 35 | 1 | 3 | 2 | 1 |
| 36 | 2 | 4 | 4 | 2 |
| 37 | 4 | 2 | 3 | 3 |
| 38 | 2 | 3 | 1 | 4 |
| 39 | 3 | 1 | 3 | 1 |
| 40 | 1 | 2 | 1 | 1 |
| 41 | 4 | 2 | 2 | 1 |
| 42 | 2 | 4 | 3 | 2 |
| 43 | 3 | 3 | 1 | 4 |
| 44 | 1 | 1 | 4 | 3 |
| 45 | 4 | 2 | 3 | 1 |
| 46 | 2 | 4 | 2 | 2 |
| 47 | 3 | 3 | 1 | 4 |
| 48 | 1 | 1 | 4 | 2 |
| 49 | 2 | 3 | 3 | 3 |

| | | | | |
|---|---|---|---|---|
| 50 | 4 | 1 | 2 | 1 |
| 51 | 1 | 2 | 1 | 4 |
| 52 | 3 | 3 | 2 | 3 |
| 53 | 2 | 1 | 4 | 1 |
| 54 | 4 | 4 | 3 | 2 |
| 55 | 1 | 3 | 1 | 4 |
| 56 | 2 | 2 | 2 | 3 |
| 57 | 3 | 1 | 4 | 1 |
| 58 | 4 | 4 | 2 | 2 |
| 59 | 1 | 3 | 3 | 4 |
| 60 | 1 | 2 | 1 | 3 |
| 61 | 2 | 1 | 1 | 4 |
| 62 | 3 | 2 | 4 | 2 |
| 63 | 1 | 4 | 3 | 3 |
| 64 | 4 | 3 | 1 | 1 |
| 65 | 3 | 1 | 2 | 4 |
| 66 | 2 | 2 | 4 | 2 |
| 67 | 1 | 4 | 3 | 3 |
| 68 | 4 | 2 | 2 | 1 |
| 69 | 3 | 3 | 1 | 2 |
| 70 | 2 | 1 | 4 | 4 |
| 71 | 1 | 4 | 3 | 2 |
| 72 | 4 | 2 | 1 | 3 |
| 73 | 3 | 3 | 2 | 1 |
| 74 | 1 | 1 | 4 | 4 |
| 75 | 2 | 4 | 3 | 3 |
| 76 | 4 | 2 | 1 | 2 |
| 77 | 3 | 3 | 2 | 1 |
| 78 | 2 | 1 | 4 | 4 |
| 79 | 1 | 2 | 3 | 3 |
| 80 | 4 | 4 | 1 | 2 |
| 81 | 3 | 4 | 4 | 2 |
| 82 | 1 | 3 | 2 | 1 |
| 83 | 2 | 1 | 1 | 4 |
| 84 | 4 | 2 | 1 | 3 |
| 85 | 3 | 4 | 3 | 2 |
| 86 | 1 | 3 | 4 | 2 |
| 87 | 2 | 1 | 2 | 3 |
| 88 | 4 | 2 | 3 | 1 |
| 89 | 3 | 4 | 1 | 4 |
| 90 | 1 | 3 | 2 | 3 |
| 91 | 2 | 2 | 1 | 3 |
| 92 | 4 | 1 | 3 | 1 |
| 93 | 3 | 4 | 2 | 2 |
| 94 | 1 | 3 | 4 | 4 |
| 95 | 2 | 2 | 1 | 3 |
| 96 | 4 | 2 | 2 | 1 |
| 97 | 3 | 3 | 3 | 2 |
| 98 | 1 | 1 | 4 | 4 |
| 99 | 3 | 4 | 1 | 3 |
| 100 | 1 | 3 | 1 | 1 |