	EXAM CODE : MA13_542012 POST : STATISTICAL COMPILER
1	The region of feasible solutions has an important property called - A. The concave property B. The convex property C. The bounded property D. The shaded property
2	Which is FALSE? A. $\frac{1}{r} = \cos\theta + 2\sin\theta + 3$ represents a conic B. $\frac{1}{r} = 4$ represents a circle C. $\frac{1}{r} = 2\cos\theta + 3\sin\theta$ represents a straight line D. $\frac{l}{r} = 1 + \cos\theta$ in an ellipse

3	The pedal equation of the parabola $\frac{2a}{r} = 1 - \cos\theta$ with respect to the focus as pole, is : A. $p^2 = ar$ B. $r^2 = \frac{p^2}{2a}$ C. $r = p$ D. $r^2 = ap$
4	Which of the statement is TRUE? A. A unit in a ring cannot be a zero divisor B. A commutative ring with unit element without zero divisors is an integral domain C. A Euclidean ring has a unit element D. All of these are true

5. A particle is moving in a straight line with uniform acceleration. If its velocity at any two points are u,v then its velocity at the midpoint will be -

A. $\sqrt{\frac{(u^2 + v^2)}{2}}$

B. $\sqrt{\frac{(u^2 + v^2)}{3}}$

C. $\sqrt{2(u^2 + v^2)}$

D. $\sqrt{\frac{(u^2 - v^2)}{2}}$

6. A particle is projected under gravity $g = 9.81\ m/sec^2$ with velocity 29.43 m/sec at an elevation 30°. The time of flight is :

A. 15

B. 2

C. 4

D. 3

7	A billiard ball collides directly with another ball of same mass in rest. If "e" is coefficient of restitution, then ratio of velocities after impact - A. $(1 - e) : (1 + e)$ B. $(2 - e) : (2 + e)$ C. $\frac{e}{2} : \frac{2}{e}$ D. $\frac{e}{1+e} : \frac{e}{1-e}$
8	A particle moves with a uniform speed, then the acceleration of the particle is : A. Uniform B. Positive C. Negative D. Zero

9	The moment of inertia of a thin uniform rod of length 2a and mass M about the line through one end of the rod of perpendicular to the rod is : A. $\frac{M(2a)^2}{3}$ B. $\frac{2}{3}M^2a$ C. $\frac{2}{3}Ma^2$ D. $\frac{2}{3}Ma$
10	A ball falls from a height "h" upon a fixed horizontal plane with coefficient of restitution "e". The whole distance covered by the ball before it comes to rest is : A. $\frac{(1+e^2)}{(1-e^2)}h$ B. $\frac{(1-e^2)}{(1+e^2)h}$ C. $\frac{(1+e^2)}{(1-e^2)h}$ D. $\left(\frac{1-e^2}{1+e^2}\right)h$

11	A cyclist describes a circular path with velocity 21 kmph. The radius of the path so that the cyclist does not slip should be greater than : (when μ= coefficient of friction = 25/36) A. 2.1 B. 3 C. 6 D. 5
12	Two particles of mass 10 kg and 15 kg are dropped from a height 10 m and 40 m respectively. The ratio of their time to reach the ground is : A. 1 : 2 B. 2 : 1 C. 4 : 1 D. 1 : 4

13	A square lamina of diagonal "l" and mass "M" has moment of inertia about its diagonal as - A. $\frac{Ml^2}{24}$ B. $\frac{Ml^2}{3}$ C. $\frac{Ml^2}{8}$ D. $\frac{Ml^2}{2}$
14	The displacement equation of a particle is given by $S = a\cos\omega t + b\sin\omega t$, where a, b, ω are constants. The path is : A. Rectilinear B. Simple harmonic C. Elliptic D. Circular

15	A ball of mass 2 kg impinges directly on a ball of mass 1 kg which is at rest. The velocity of the former before impact is equal to the velocity of the later after impact. The coefficient of restitution "e" is : A. 1/4 B. 1 C. 1/2 D. 1/3	
16	A particle is projected with the velocity 49 m/sec at an elevation 30°. The greatest height attained is: [where g =9.8 m/sec^2 gravitational force] A. $\frac{25g}{8}$ B. 30g C. 4.9g D. $\frac{8g}{25}$	

17 The moment of inertia of a right angled isosceles triangle about the hypotenuse of length "a" is :

A. $\frac{Ma^2}{24}$

B. $\frac{4Ma^2}{3}$

C. $\frac{2Ma^2}{3}$

D. $\frac{M^2a}{24}$

18 The radius of curvature at the lowest point of the catenary $y = c\cosh\left(\frac{x}{c}\right)$; is

A. c

B. 0

C. ∞

D. 1

19	The evolute of the cycloid is : A. Another cycloid B. Parabola C. Ellipse D. Hyperbola
20	Radius of curvature for the cardioid $r = a(1 + \cos\theta)$ is : A. $\frac{2}{3}\sqrt{ar}$ B. $\frac{1}{3}\sqrt{3ar}$ C. $\frac{1}{3}\sqrt{2ar}$ D. $\frac{2}{3}\sqrt{2ar}$

21	The points on the parabola $y^2 = 4x$ at which the radius of curvature is $+\sqrt{2}$, are – A. (1, 1) and (2, 2) B. (1, 2) and (1, -2) C. $(2, 1)$ and $(2, 2\sqrt{2})$ D. $(3, \sqrt{12})$ and $(3, -\sqrt{12})$
22	$\frac{l}{r} = 1 + e\cos\theta$, where $e > 1$, is equation of – A. Ellipse B. Parabola C. Hyperbola D. None of these
23	The equation of asymptote of $x^3 + y^3 = 3axy$, is : A. $x + y - a = 0$ B. $x - y + a = 0$ C. $x + y + a = 0$ D. $x - y - a = 0$

24	The l.p.p. Max $z = 3x_1 + 4x_2$ Subject to $x_1 - x_2 \le -1$ $-x_1 + x_2 \le 0,$ $x_1, x_2 \ge 0$ has: A. Feasible solution B. Unique solution C. Infeasible solution D. Unbounded solution
25	When the basis matrix is not an identity matrix for an l.p.p, we introduce a new type of variable called the – A. Slack variable B. Surplus variable C. Artificial variable D. Dummy variable

26	In a simplex table of a l.p.p. alternative optimal solutions exist if – A. All basic Δ_j are zero B. At least one Δ_j is negative C. All Δ_j are zero or negative D. Any non basic Δ_j is also zero
27	$\theta = \beta$ represents the polar equation of – A. A constant angle B. Circle C. Conic D. Straight line
28	The polar equation of circle with centre $\left(4, \pi/4\right)$ and radius 2 is : A. $r^2 - 8\cos\left(\theta + \pi/4\right) + 12 = 0$ B. $r^2 + 8\cos\left(\theta - \pi/4\right) + 12 = 0$ C. $r^2 - 8\cos\left(\theta - \pi/4\right) + 12 = 0$ D. $r^2 - 8\cos\left(\theta - \pi/4\right) - 12 = 0$

29	What is the equation of the conic (in polar) if S (focus) is taken as pole and OX' (negative direction of the axis) is taken as initial line ? A. $\frac{1}{r} = A\cos\theta + B\sin\theta$ B. $\frac{l}{r} = 1 + e\cos\theta$ C. $r = 2\cos\theta$ D. None of these
30	The lines $r(\cos\theta + \sin\theta) = \pm 1$ and $r(\cos\theta - \sin\theta) = \pm 1$ enclose a : A. Square B. Rhombus C. Rectangle D. Quadrilateral

31	The envelope of a system of concentric ellipses with their axes along the coordinate axes and of constant area is : A. Parabola B. Ellipse C. Astroid D. Rectangular Hyperbola (RH)
32	The equation of the tangent to the circle $r = 10\cos\theta$ at $\theta = \pi/4$ is: A. $r\sin\theta = 1$ B. $r\sin\theta = 10$ C. $r\sin\theta = 5$ D. $r\sin\theta = 2$
33	Which pair of straight lines are parallel? A. $\cos\theta + \sin\theta = \frac{1}{r}, \cos\theta - \sin\theta = \frac{1}{r}$ B. $\cos\theta + \sin\theta = \frac{\sqrt{2}}{r}, \cos\theta + \sin\theta = \frac{10\sqrt{2}}{r}$ C. $2\cos\theta + \sin\theta = \frac{2}{r}, \cos\theta + 2\sin\theta = \frac{2}{r}$ D. $2\cos\theta + \sin\theta = \frac{2}{r}, 2\cos\theta - \sin\theta = \frac{2}{r}$

34	Which is TRUE? The equations A. $\frac{l}{r} = 1 - e\cos\theta$ and $\frac{l}{r} = -1 - e\cos\theta$ represent the same conic. B. $r = 10\cos\theta$ represents a straight line C. $r\sin\theta = 10$ represents a circle D. r = 5 represents a straight line
35	The directrix of the conic $\frac{l}{r} = 1 + e\cos\theta$ is: A. $\frac{l}{r} = e\cos\theta$ B. $\frac{l}{r} = -e\cos\theta$ C. $\frac{l}{r} = \sin\theta$ D. $\frac{l}{r} = -\sin\theta$

36	The envelope of circles whose centres lie on the parabola $y^2=4ax$ and which passes through its vertex is : A. $x^3 + y^2(x + 2a) = 0$ B. $y^3 + x^2(y + 2a) = 0$ C. $x^3 + y^2(x - 2a) = 0$ D. $y^3 + x^2(y - 2a) = 0$
37	Partial differential equation obtained by eliminating a and b from $az + b = a^2 x + y$ is : A. $\left(\frac{\partial z}{\partial x}\right) \cdot \left(\frac{\partial z}{\partial y}\right) = -1$ B. $\left(\frac{\partial z}{\partial x}\right) \cdot \left(\frac{\partial z}{\partial y}\right) = 1$ C. $\frac{\partial z}{\partial x} = \frac{\partial z}{\partial y}$ D. $\frac{\partial z}{\partial x} = -\frac{\partial z}{\partial y}$

38	General solution of $x^2 \frac{d^2y}{dx^2} - 3x\frac{dy}{dx} + 4y = 0$ is: A. $(c_1 + c_2 x)e^{2x}$ B. $c_1 . e^{2x} + c_2 . e^{-2x}$ C. $(c_1 + c_2 \log x) . x^2$ D. $(c_1 + c_2 \log x) . \frac{1}{x^2}$
39	Particular integral of $(D^2 + D)y = x^2 + 2x + 4$, where $D \equiv \frac{d}{dx}$, is: A. $x^2 + 4$ B. $\frac{x^3}{4} + 4x$ C. $\frac{x^2}{2} + 4$ D. $\frac{x^3}{3} + 4x$

40	Particular integral of the differential equation $(4D^2 - 12D + 9)y = 144e^{\frac{3x}{2}}$ where $D \equiv \frac{d}{dx}$ is : A. $18x^2\ e^{\frac{3x}{2}}$ B. $18x^2\ e^{-\frac{3x}{2}}$ C. $36x^2\ e^{\frac{3x}{2}}$ D. $36x^2\ e^{-\frac{3x}{2}}$
41	The necessary and sufficient condition for the integrability of total differential equation Pdx + Qdy + Rdz = 0 is : A. $P\left(\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y}\right) - Q\left(\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}\right) + R\left(\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}\right) = 0$ B. $P\left(\frac{\partial Q}{\partial z} - \frac{\partial R}{\partial y}\right) + Q\left(\frac{\partial R}{\partial x} - \frac{\partial P}{\partial z}\right) + R\left(\frac{\partial P}{\partial y} - \frac{\partial Q}{\partial x}\right) = 0$ C. $P\left(\frac{\partial Q}{\partial z} + \frac{\partial R}{\partial y}\right) - Q\left(\frac{\partial R}{\partial x} + \frac{\partial P}{\partial z}\right) - R\left(\frac{\partial P}{\partial y} + \frac{\partial Q}{\partial x}\right) = 0$ D $P\left(\frac{\partial Q}{\partial z} + \frac{\partial R}{\partial y}\right) - Q\left(\frac{\partial Q}{\partial z} + \frac{\partial R}{\partial y}\right) + R\left(\frac{\partial P}{\partial y} + \frac{\partial Q}{\partial x}\right) = 0$

42	Solutions of the differential equation $\left(\frac{dy}{dx}\right)^2 - ax^3 = 0$ are : A. $5(y + c) = \pm 2a^{1/2}\ x^{5/2}$ B. $2(y + c) = \pm 5a^{1/2}\ x^{3/2}$ C. $2(x + c) = \pm 5a^{-1/2}\ y^{5/2}$ D. $y + c = \pm\frac{5\sqrt{a}}{y^{\frac{5}{2}}}$
43	Laplace transform of $f(t) = e^{-2t}(3\cos 6t - 5\sin 6t)$ A. $\frac{3s + 24}{s^2 + 4s + 40}$ B. $\frac{3s - 24}{s^2 + 4s + 40}$ C. $\frac{3s + 12}{s^2 + 2s + 20}$ D. $\frac{3s - 12}{s^2 - 4s + 20}$

44	The slope at any point of a curve $y = f(x)$ is given by $\frac{dy}{dx} = 3x^2$ and it passes through $(-1,1)$. The equation of the curve is : A. $y = x^3 + 2$ B. $y = -x^3 - 2$ C. $y = x^3$ D. $y = -x^3 + 2$
45	The order of the differential equation $\sqrt{1+\left(\frac{dy}{dx}\right)^2} = \frac{d^2y}{dx^2}$ A. $\frac{1}{2}$ B. 2 C. 1 D. 4

46	If the first quartile is 104 and quartile deviation is 18, find the third quartile. A. 138 B. 132 C. 140 D. 142
47	The solution to the differential equation $yz\,dx + zx\,dy + xy\,dz = 0$ A. $xyz = c$ B. $yz + xz + xy = c$ C. $x + y + z = c$ D. $x^2 + y^2 + z^2 = c$

48	The particle integral of differential equation $\left(D^2 + a^2\right)y = \cos ax$ A. $\frac{x}{2a}\cos ax$ B. $\frac{x}{2a}\sin ax$ C. $\frac{1}{2a}\sin ax$ D. $\frac{-1}{2a}\cos ax$
49	The complimentary function of $\left(x^2D^2 - 3xD - 5\right)\ y = 0$ A. $Ae^{5x} + Bx^{-1}$ B. $\frac{A}{x^5} + Bx$ C. $Ax^5 + \frac{B}{x}$ D. $A\cos 5x + B\sin x$

50	The complimentary function of $(D^2+4)y = \sin 2x$ A. $A \cos 2x + B \sin 2x$ B. $Ae^{-2x}+Be^{2x}$ C. $e^{-x}(A \sin 4x+B \sin 4x)$ D. $e^{-2x}(A \sin 2x+B \sin 2x)$
51	The partial differential equation by eliminating a, b of $Z = ax^3 + by^3$ is : A. $px + qy = z$ B. $px^3 + 9y^3 = z$ C. $px + qy = 3z$ D. $p^3x + q^3y = z$
52	The value of L(sin 3t cos 4t) is : A. $\frac{1}{2}\left[\frac{7}{s^2+49} - \frac{1}{s^2+1}\right]$ B. $\frac{1}{2}\left[\frac{7}{s^2+49} + \frac{1}{s^2+1}\right]$ C. $\frac{1}{2}\left[\frac{s}{s^2+7} - \frac{s}{s^2+1}\right]$ D. $\frac{1}{2}\left[\frac{s}{s^2+49} - \frac{s}{s^2+1}\right]$

53	The inverse Laplace of $\left(\frac{1}{s^2}\right)$ is: A. t^2 B. $\frac{1}{t}$ C. t D. $\frac{1}{t^2}$
54	The value of $L^{-1}\left(\frac{2s}{s^2+4}\right)$ *is* : A. $\frac{1}{2}t\sin 2t$ B. $\frac{1}{4}t^2\sin t$ C. $\frac{-1}{2}t\sin 2t$ D. $\frac{-t^2}{4}\sin t$

55	The differential equation $x\,dy - y\,dx = 2x^3\,dx$ has the solution : A. $x^2 + y = Cx^3$ B. $-x^3 + y = Cx$ C. $x^3 + y = Cx$ D. $-x^2 + y = C$
56	The Laplace transform $L(te^t)$ is : A. $\frac{1}{(s-1)^2}$ B. $\frac{-1}{(s-1)^2}$ C. $\frac{1}{(s+1)^2}$ D. $\frac{1}{s^2}$

57	Which of the following is NOT a general method for solving operations research models ? A. Analytic method B. Iterative method C. Probabilistic method D. The Monte-Carlo method
58	The simple method of linear programming was developed by – A. George B. Dantzig B. Cantor C. George Boole D. Jhonson
59	Which one of the following type does NOT form the part of constraints in l.p.p ? A. Less than or equal to B. Not equal to C. Greater than or equal to D. Equal to

60	Equation r = a represents the polar equation of – A. Straight line B. Circle C. Cone D. Cylinder
61	The angle of intersection of the curves $r = \sin\theta + \cos\theta$ and $r = 2\sin\theta$ is : A. $\frac{\pi}{4}$ B. $\frac{3\pi}{4}$ C. $\frac{5\pi}{4}$ D. $\frac{7\pi}{4}$
62	The number of factors of the number 2025 is : A. 25 B. 81 C. 8 D. 15

63	$\frac{1^2.2}{\lfloor 1} + \frac{2^2.3}{\lfloor 2} + \frac{3^2.4}{\lfloor 3} + \frac{4^2.5}{\lfloor 4} + ..\infty$ The sum of the above series is : A. 5e B. 3e C. 7e D. 2e
64	Fermat's theorem states " If P is prime and a is any number prime to P then N is divisible by P". What is N ? A. $a^{P+1} - 1$ B. $a^{P} - 1$ C. $a^{P-1} + 1$ D. $a^{P-1} - 1$
65	The sum of all divisors of 480 is . A. 706 B. 1412 C. 252 D. 398

66	$\underset{x \to a}{\text{Lim}} \left(2 - \frac{x}{a}\right)^{\tan\left(\frac{\pi x}{2a}\right)} =$ A. $e^{2\pi}$ B. e^{1} C. $\frac{\pi}{2}$ D. $e^{2/\pi}$
67	$\underset{x \to b}{\text{Lt}} \frac{x^b - b^x}{x^x - b^b} = ?$ A. $\frac{1 - \log b}{1 + \log b}$ B. $\log b$ C. $\frac{1}{\log b}$ D. $\frac{1 + \log b}{1 - \log b}$

68	The sum of the series $2\left[1+\frac{(\log e^{n})^{2}}{\lfloor 2}+\frac{(\log e^{n})^{4}}{\lfloor 4}+\ldots\infty\right]=?$ A. $n^2 + 1$ B. $n + 1/n$ C. $n^2 - 1$ D. $n - 1/n$
69	If $\left\|\frac{1}{2n+1}\right\| < 1$ then $2\left[\frac{1}{(2n+1)}+\frac{1}{3(2n+1)^{3}}+\frac{1}{5(2n+1)^{5}}+\ldots\right]=$ A. $\log\left(\frac{n}{n+1}\right)$ B. $\log\left(\frac{n+1}{n}\right)$ C. $\log\left(\frac{2n+1}{n}\right)$ D. $\log\left(\frac{n}{2n+1}\right)$

70	$\underset{x \to 0}{Lt} \dfrac{e^{ax} - e^{bx}}{x} =$ A. $e^a - e^b$ B. e^{a-b} C. e^{b-a} D. $(a - b)$
71	The numbers 496 is: A. Fibonacci number B. Fermat number C. Perfect number D. Prime number
72	The sum of the series using Binomial theorem $1 + \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \ldots\ldots$ is: A. $\sqrt{2} + 1$ B. $\sqrt{2} - 1$ C. $2\sqrt{2} - 1$ D. $2\sqrt{2}$

73 The sum of the series to ∞

$$\frac{1}{\underline{|1}} + \frac{1+2}{\underline{|2}} + \frac{1+2+3}{\underline{|3}} + \ldots + \infty \text{ is:}$$

A. e/2

B. e

C. $\frac{3}{2}e$

D. 2 e

74 When |x| <1 and if

$$f = \frac{x}{1+x^2} + \frac{1}{3}\left(\frac{x}{1+x^2}\right)^3 + \frac{1}{5}\left(\frac{x}{1+x^2}\right)^5 + \ldots..$$

$$then\, \frac{1}{2}\log\left(\frac{1+x+x^2}{1-x+x^2}\right) = \ldots\ldots\ldots$$

A. 2f

B. f

C. f^2

D. 3f

75 The sum of the series

$$\left(\frac{a-b}{a}\right)+\frac{1}{2}\left(\frac{a-b}{a}\right)^2+\frac{1}{3}\left(\frac{a-b}{a}\right)^3+\ldots.$$

will be equal to :

A. $log_e ab$

B. $log_e (b : a)$

C. $log_e (a / b)$

D. $log_e a^b$

76

$$If\ Y = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \ldots\ldots\ldots\infty$$

$and |x| < 1 then$

$$y + \frac{y^2}{\lfloor 2} + \frac{y^3}{\lfloor 3} + \frac{y^4}{\lfloor 4} + \ldots\ldots\ldots\infty\ is :$$

A. e^x

B. x

C. $\log_e (1 + y)$

D. $\log_e (1 - y)$

77	The equation $x^2 + y^2 + z^2 + 2ux + 2vy + 2wz + d = 0$ *represents a sphere iff* $u^2 + v^2 + w^2 - d$ *is* : A. Zero or negative B. Negative C. Zero D. Positive
78	The radius of circle in which the sphere $x^2 + y^2 + z^2 + 2x - 2y - 4z - 19 = 0$ is cut by the plane x + 2y + 2z + 7 = 0 is: A. 4 B. 1 C. 2 D. 3

79	The shortest distance from the plane $12x + 4y + 3z = 327$ to the sphere $x^2 + y^2 + z^2 + 4x - 2y - 6z = 155$ is: A. 39 B. 26 C. $41\frac{4}{13}$ D. 13
80	$\int_{-\pi}^{\pi} \int_{0}^{2} r \sin\theta \, dr \, d\theta = ?$ A. 0 B. π C. $-\pi$ D. 2
81	If $y = e^{\tan^{-1} x}$ *then* $(1 + x^2) y_2 + 2xy_1 = ?$ A. y B. y_1 C. y^2 D. xy_1

82	The area bounded by one arch of the cycloid $x = a(\theta - \sin\theta)$ $y = a(1 - \cos\theta)$ and the x-axis is: A. $3\pi a^2$ B. $4\pi a^2$ C. πa^2 D. $2\pi a^2$
83	The value of $\sqrt{(1/2)}$ is: A. $\pi / 2$ B. $-2\sqrt{\pi}$ C. π D. $\sqrt{\pi}$

84	If $I_n = \int_0^{\frac{\pi}{4}} \tan^n x dx$ then $I_n + I_{n-2} =$ A. $\frac{1}{n-2}$ B. $\frac{1}{n}$ C. $\frac{n}{n-1}$ D. $\frac{1}{n-1}$
85	$\int_{-1}^{2} \lvert x-1 \rvert dx =$ A. 2/5 B. 5 C. 5/2 D. 2

86	If $y = \sin^{-1} x$ then $(1-x^2)y_2 =$ A. xy B. y_1 C. xy_1 D. $x^2 y$
87	$\int_0^{\infty} \sqrt{x}\, e^{-x^3} dx =$ A. $\sqrt{\pi}$ B. $\sqrt{\pi}/3$ C. $\sqrt{\pi}/2$ D. $\pi/3$

88

$\int_0^{\pi/6} \sin^7 3x\,dx =$

A. $\frac{8}{15}$

B. 105

C. 48

D. $\frac{16}{105}$

89

If x+y+z = u, y+z = uv, z = uvw then

$\frac{\partial(x,y,z)}{\partial(u,v,w)} = ?$

A. u^2

B. u^2v

C. uvw

D. uv^2

90	$\int e^x(\tan x + \sec^2 x)\,dx =$ A. $e^x \tan x \sec x + c$ B. $e^x \tan x + c$ C. $e^x \sec^2 x + c$ D. $e^2 \sec x + c$
91	Evaluate $\iint_R y^2\,dx\,dy$ when R is the region bounded by y = 2x, y = 5x and x = 1. A. 117 B. 39 C. 48 D. $\frac{39}{4}$

92	$\int_0^{\infty} \frac{dx}{(1+x^2)^2} =$ A. $\pi/4$ B. $\pi/8$ C. π D. 2π
93	If $x = u(1+v)$ *and* $y = v(1+u)$ then $\frac{\partial(x,y)}{\partial(u,v)} = ?$ A. u+v B. 1+u C. 1+u+v D. 1+v

94	In which of the following cases $(1-x^2)y_2 - xy_1 = 0$ where $y_1 = \frac{dy}{dx}$ and $y_2 = \frac{d^2y}{dx^2}$ A. $Cos\left(m\sin^{-1}x\right) = y$ B. $y = (\sin^{-1}x)^2$ C. $y = (\cos^{-1}x)$ D. $y = \tan^{-1}x$
95	$\int_o^{\pi/2}\int_0^{\pi/2} \sin(\theta + \phi)\, d\theta d\phi = ?$ A. 1 B. 0 C. 3 D. 2

96	{0, 1} is a set with the operations defined by the following tables : + | 0 1 0 | 0 1 1 | 1 0 . | 0 1 0 | 0 0 1 | 0 1 Which statement is TRUE? A. {0, 1} is not a ring B. {0, 1} is a ring C. {0, 1} is a ring with unit element D. {0, 1} is a commutative ring with unit element
97	If T is an automorphism of a group G such that $Tx = x^{-1} \forall x \in G$, then: A. G is not abelian B. G is abelian C. Ker T $\neq \{e\}$ D. T^{-1} does not exist

98	The order of 2 and 3 in (Z_8 , $+_8$) are: A. O(2) =4 . O(3) = 8 B. O(2) = 2 . O(3) = 4 C. O(2) = 8 , O(3) is infinite D. O(2) = 0 . O(3) = 1
99	Consider the group G = {1. -1. i, -i} under multiplication. Then- A. G is a cyclic group generated by 1 B. G is a cyclic group generated by -1 C. G is a cyclic group generated by i only D. G is a cyclic group generated by i and-i

100 The product of two eigen values of

$$A = \begin{bmatrix} 6 & -2 & +2 \\ -3 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$ is 14. Find the third eigen value.

A. 1

B. 2

C. 3

D. 4

101 Rank of $\begin{bmatrix} 9 & 7 & 3 \\ 5 & -1 & 4 \\ 3 & 5 & 1 \end{bmatrix}$ = rank of

$$\begin{bmatrix} 9 & 7 & 3 & 6 \\ 5 & -1 & 4 & 1 \\ 3 & 5 & 1 & 2 \end{bmatrix} = 3$$

then the system of equations:

$9x - 7y + 3z = 6$

$5x - y - 4z = 1$

$3x + 5y + z = 2$

A. Are consistent and posses infinite number of solutions

B. Are consistent and posses unique solution

C. Are inconsistent and posses no solution

D. Have solutions other than (1. 0. -1)

102	The inverse of $A = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ is: A. $\begin{bmatrix} -5/2 & 3/2 \\ 2 & -1 \end{bmatrix}$ B. $\begin{bmatrix} 5/2 & 3/2 \\ -2 & 1 \end{bmatrix}$ C. $\begin{bmatrix} -5 & 3 \\ 1 & -1/2 \end{bmatrix}$ D. does not exist
103	The eigen values of $A = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$ are A. -1, 3, -4 B. 1, 3, 4 C. 3, 3, 2 D. 1, 5, 2

104	If R is a ring with zero element, then which is TRUE? A. {o} is an ideal in R but R is not ideal in R B. R is an ideal but {o} is not an ideal in R C. Both {o} and R are ideals in R D. R has no non trivial ideals or improper ideals
105	Which of the following is true? A. The ring Z of integers has a zero divisor B. The ring Q of rationals has a zero divisor C. The ring r of reals has a zero divisor D. Z, Q, R and C have no divisors of zero

106	Q = The set of rationals, under usual multiplication is: A. A group B. Not a group C. A commutative group D. Not closed
107	Let G is a group of prime order P. Then which is false? A. G is cyclic B. G has no proper sub groups C. G has proper sub groups D. G has P-1 generators
108	If G is a group, then the centre Z (G) is defined by $Z(G) = \{z \in G \,/\, z\,x = x\,z$ for all $x \in G\}$. Then- A. Z (G) is not a sub group of G B. Z (G) is a sub group of G but not normal C. Z (G) is a normal sub group of G D. G = Z (G)

109	Let H and K be two finite sub groups of a group G. Then which of the following is NOT true? A. HK is not a sub group of G if HK = KH B. HK is a sub group of G if and only if HK = KH C. HK is a sub group of G if G is abelian D. O (HK) = $\frac{O(H)\ O(K)}{O(H \cap K)}$
110	Let G = {1, -1, i, -i}, which is normal? A. $\{-1, i\}$ B. $\{-1, -i\}$ C. $\{1, -1\}$ D. $\{i, -i\}$

111	Let G is a group of order 2 then - A. There is no automorphism of G B. There can be many automorphism of G C. There is only one automorphism that is the identity mapping D. There is only one automorphism that is not the identity mapping
112	A person goes from x to y on cycle at 20 km/hr & returns at 24 km/hr. His average speed is: A. 22 B. 21.82 C. 22.42 D. 23.12

113	Find the value of p for the following distribution whose mean is 16.6. x : 8 12 15 p 20 25 30 f : 12 16 20 24 16 8 4 A. 16.5 B. 17.5 C. 16 D. 18
114	Karl - Pearson's Coefficient of skewness is given by, Skewness = A. $\frac{\text{Mode-Mean}}{\text{Standard Deviation}}$ B. $\frac{\text{Standard deviation}}{\text{Mean-Mode}}$ C. $\frac{\text{Mean-Mode}}{\text{Standard deviation}}$ D. $\frac{\text{Standard deviation}}{\text{Mode-Mean}}$

115	Bowley coefficient of skewness lies between: A. -1 and +1 B. -3 and +3 C. -0.5 and 0.5 D. None of these
116	Coefficient of Correlation is the ____ mean of regression coefficients. A. Arithmetic B. Geometric C. Harmonic D. Grouped mean
117	Moment generating function of a normal random variable about its origin is given by : A. $e^{-\mu t+1/2\sigma^2 t^2}$ B. $e^{\mu t+\frac{1}{2}\sigma^2 t^2}$ C. $e^{\mu t-\frac{1}{2}\sigma^2 t^2}$ D. $e^{-(\mu t+1/2\sigma^2 t^2)}$

118	Arithmetic mean of two regression coefficients is: A. Square root of the correlation coefficient B. Equal to the correlation coefficient C. Less than the correlation coefficient D. Greater than the correlation coefficient
119	The odds that x speaks the truth are 3:2 and the odds that person y speaks truth are 3:5. In what percentage of cases are they likely to contradict each other on an identical point? A. 45.5% B. 46.5% C. 47.5% D. 47.8%

120	In a binomial distribution, which of the following is wrong? A. Mean = np B. $0 < p < 1$, $0 < q < 1$ C. Mean $\leq$ Variance D. Variance = npq
121	In a normal distribution, ratio between Quartile deviation, Mean deviation & Standard deviation is: A. 10 : 12 : 15 B. 10 : 11 : 15 C. 10 : 14 : 15 D. 11 : 13 : 15

122	Which of the following statement is FALSE? A. Two independent variables are uncorrelated B. r(x, y)=0 => Absence of any linear relationship between x and y C. Uncorrelated variables are independent D. Correlation coefficient is independent of change of origin and scale
123	x^2 - distribution CANNOT be applied to test: A. If the hypothetical value of the population variance is $\sigma^2 = \sigma_o^2$ (say) B. The goodness of fit C. The independence of attributes D. If the hypothetical value of the population mean is $\bar{x} = \mu$ (say)

124	99 % fiducial limits for the mean of normal distribution are : A. $\bar{x} \pm 2.58 \frac{\sigma}{n}$ B. $\bar{x} \pm 2.58 \frac{\sigma}{\sqrt{n-1}}$ C. $\bar{x} \pm 2.58 \frac{\sigma}{\sqrt{n}}$ D. $\bar{x} \pm 2.33 \frac{\sigma}{\sqrt{n-1}}$
125	Coefficient skewness of a Poisson distribution is: A. $1/\lambda$ B. $3+\frac{1}{\lambda}$ C. $1-\lambda$ D. $\lambda-1$

126	χ^2 - Values ________ with the _____ in degrees of freedom. A. Increase , Decrease B. Decrease, Increase C. Increase, Increase D. Remain constant, Increase
127	A & B are events such that $p(A \cup B) = \frac{3}{4}; p(A \cap B) = \frac{1}{4}$ $P(\overline{A}) = \frac{2}{3}$ $then\, P(B) = ?$ A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{1}{12}$ D. $\frac{3}{4}$

128	Given two regression lines: $3x + 2y = 26$ *and* $6x + y = 31$ Find the regression coefficient by x. A. $\frac{3}{2}$ B. $\frac{-3}{2}$ C. $\frac{-1}{6}$ D. $\frac{1}{6}$
129	Compute the quartiles $Q_1, Q_2, and\ Q_3$ for the data : 9, 13, 14, 7, 12, 17, 8, 10, 6, 15, 18, 21, 20 A. 8, 13, 17 B. 8.5, 13, 17.5 C. 8, 13.5, 17.5 D. 8.5, 13.5, 17.5

130	The best measure of comparing the variability of two series is: A. Standard deviation B. Coefficient of variation C. Correlation coefficient D. Coefficient of skewness
131	In testing the independence of attributes in a 3 x 3 contingency table, using χ^2-test, the number of degrees of freedom is: A. 4 B. 8 C. 6 D. 12
132	If $\phi = \log \mid r \mid then \nabla \phi is$: A. $-\vec{r}/r^2$ B. $+\vec{r}/r^2$ C. $-\vec{r}/r^3$ D. $+\vec{r}/r^3$

133	The side of a square lamina ABCD is 2a metres. Along $\overline{AB}, \overline{CB}, \overline{CD}, \overline{AD}$ and $\overline{BD}$ act forces of magnitudes 1, 2, 3. 4 and 5 kg weight respectively. Then the algebraic sum of then moments about the centre of the square is: A. -2a kg metres B. $-2\sqrt{2}\,a\,kg$ metres C. $\left(2+5\sqrt{2}\right)a\,kg$ metres D. $\left(2-5\sqrt{2}\right)a\,kg$ metres
134	Two equal unlike parallel forces form a - A. Resultant force B. Coplanar system C. Couple D. Parallel system

135	Three forces acting on a particle are in equilibrium. The angle between the first and the second is 90° and that between the second and the third is 120°. The ratio of the forces is: A. $\sqrt{3}:1:2$ B. $1:2:\sqrt{3}$ C. $1:\sqrt{3}:2$ D. $\sqrt{3}:2:1$
136	The resultant of two forces P and Q is R_1. If one of the forces be reversed in direction, the resultant becomes R_2. Then $R_1^2 + R_2^2$ is: A. $R_1^2 + R_2^2 = o$ B. $R_1^2 + R_2^2 = P^2$ C. $R_1^2 + R_2^2 = 2(P^2 + Q^2)$ D. $R_1^2 + R_2^2 = 2(P^2 - Q^2)$

137	The centre of gravity of a solid cone of height h lies on the axis at a distance of: A. $\frac{3}{8}$h from the vertex B. $\frac{h}{3}$ from the vertex C. $\frac{3h}{4}$ from the vertex D. $\frac{h}{2}$ from the vertex
138	Two forces $\overline{P}\ and\ \overline{Q}$ act on a particle. If the sum and difference of forces are at right angles to each other, then: A. P > Q B. Q > P C. P = Q D. $P \neq Q$

139	Two forces of magnitudes P and Q act at a point. If the direction of $\overline{Q}$ is reversed, then the resultant turns through a right angle. Then: A. P = 2Q B. Q = 2 P C. P = Q D. $P \neq Q$
140	S is the circum centre of a triangle ABC. If forces of magnitudes $\overline{P}, \overline{Q}, \overline{R}$ acting along SA, SB, SC are in equilibrium, then: A. $\frac{P}{\sin A} = \frac{Q}{\sin B} = \frac{R}{\sin C}$ B. $\frac{P}{\sin A/2} = \frac{Q}{\sin B/2} = \frac{R}{\sin C/2}$ C. $\frac{P}{\sin 2A} = \frac{Q}{\sin 2B} = \frac{R}{\sin 2C}$ D. $\frac{P}{\cos A} = \frac{Q}{\cos B} = \frac{R}{\cos C}$

141	If λ is the angle of friction, then $\tan\lambda = \mu$ is : A. $\frac{\text{Limiting friction}}{\text{Normal reaction}}$ B. $\frac{\text{Force of friction}}{\text{Reaction}}$ C. $\frac{\text{Normal reaction}}{\text{Reaction}}$ D. $\frac{\text{Normal reaction}}{\text{Limiting friction}}$
142	If three parallel forces $\overline{P}, \overline{Q}$ and $\overline{R}$ acting at A, B and C respectively are in equilibrium, then P : Q : R is : A. 1 : 1 : 2 B. AC : CB : AB C. BC : CA : AB D. AB : BC : AC

143	Unit normal to the surface $x^2y+2xz=4$ at the point (2, −2, 3) is : A. $\frac{\hat{i}+2\hat{j}+2\hat{k}}{3}$ B. $\frac{\hat{i}-2\hat{j}+2\hat{k}}{3}$ C. $\frac{\hat{i}+2\hat{j}-2\hat{k}}{3}$ D. $\frac{-\hat{i}+2\hat{j}+2\hat{k}}{3}$

144	I is the in centre of a triangle ABC. If forces $\overline{P}, \overline{Q}, \overline{R}$ acting along IA, IB, IC are in equilibrium, then- A. $\frac{P}{\cos A} = \frac{Q}{\cos B} = \frac{R}{\cos C}$ B. $\frac{P}{\cos \frac{A}{2}} = \frac{Q}{\cos \frac{B}{2}} = \frac{R}{\cos \frac{C}{2}}$ C. $\frac{P}{\cos 2A} = \frac{Q}{\cos 2B} = \frac{R}{\cos 2C}$ D. $\frac{P}{\sin \frac{A}{2}} = \frac{Q}{\sin \frac{B}{2}} = \frac{R}{\sin \frac{C}{2}}$
145	$\nabla \times \vec{r} =$ A. A constant vector B. Zero vector C. $\frac{\vec{r}}{\|\vec{r}\|}$ D. None of these

146	$\int_C (xy - x^2)\,dx + x^2y\,dy$ over the triangle bounded by the lines y = 0. x = 1, y = x is : A. $\frac{1}{12}$ B. $-\frac{1}{12}$ C. $\frac{1}{24}$ D. $-\frac{1}{24}$
147	If $t_n = \frac{\sum n}{\lfloor n}$ then $\sum_{n=0}^{\infty} t_n = ?$ A. e B. e^{-1} C. $\frac{3e}{2}$ D. $\frac{e}{2}$

148	If $\overline{F} = x\hat{i} + y\hat{j} + z\hat{k}$ and S is taken over the region bounded by the planes x = 0, x = a, y = 0, y = a, z = 0 and z = a, then the value of $\iint_S \overline{F}.\hat{n}ds$ is: A. a^3 B. $3a^3$ C. $\frac{a^3}{3}$ D. $4a^3$
149	If $\overline{r} = x\hat{i} + y\hat{j} + z\hat{k}$ is the position vector of the point (x, y, z) then the value of $\nabla^2\left(\frac{1}{r}\right) is:$ A. $-\frac{\overline{r}}{r^3}$ B. 0 C. 3 D. $\frac{1}{3}$

150	If $\overline{A}$ *and* $\overline{B}$ are irrotational, which of the following is WRONG? A. $\overline{B}.(\nabla \times \overline{A}) = 0$ B. $\overline{A}.(\nabla \times \overline{B}) = 0$ C. $\overline{A} \times \overline{B}$ is not solenoidal D. $\overline{A} \times \overline{B}$ is solenoidal
151	If $\overline{r}$ is the position vector of the point (x, y, z) then which is TRUE? A. $\text{div}\,\overline{r} = 3$ B. $\nabla r = \frac{\overline{r}}{r}$ C. $\nabla \times \overline{r} = 0$ D. All of these are true

152	Unit vector normal to the surface $x^2 + 3y^2 + 2z^2 = 6$ at the point (2, 0, 1) is : A. $\frac{\hat{i}+2\hat{k}}{\sqrt{5}}$ B. $\frac{\hat{i}+\hat{k}}{\sqrt{2}}$ C. $\frac{\hat{i}+\hat{j}+\hat{k}}{3}$ D. $\frac{\hat{i}+2\hat{j}+3\hat{k}}{\sqrt{14}}$
153	The directional derivative of xyz at the point (1, 2, -1) in the direction of $\hat{i}-\hat{j}-3\hat{k}$ is: A. $\frac{7}{\sqrt{11}}$ B. $-\frac{7}{\sqrt{11}}$ C. $\frac{29}{\sqrt{11}}$ D. $-\frac{29}{\sqrt{11}}$

154	If a system of coplanar forces reduces neither to a single force nor to a single couple, then the system is : A. Diverging one B. In equilibrium C. Not in equilibrium D. None of these
155	Symmetric difference of sets A and B is defined as: A. $(A-B)\cap(B-A)$ B. $(A-B)\cup(B-A)$ C. $(A-B)\cap(B+A)$ D. $(A+B)\cup(B-A)$
156	A closed subspace of a compact metric space is : A. Open B. Compact C. Need not be compact D. None of these

157	In a metric space M, the full space M is : A. An open set B. A closed set C. Neither open nor closed D. Both open and closed
158	Which of the following is compact? A. Set of all integers in R' B. Set of all rationals in R' C. [1,2] in R' D. $(0,\infty)$ in R'
159	For thesequence $\{a_n\}_{n=1}^{\infty} = \{(-1)^n\}_{n=1}^{\infty}$ $\limsup_{n\to\infty} a_n = ?$ A. 0 B. -1 C. 1 D. None of these

160	Which of the following set is NOT "no where dense" in R^1 ? A. The set of all positive integers B. The Cantor set C. Every finite subset of R^1 D. The interval (0,1) in R^1
161	If M = R_d ,the real line with discrete metric, and if 'a' is any point in R_d then 1) B[a,1]= ? and 2) B[a,2]= ? A. (a−1, a+1), (a−2, a+2) B. {a}, {a} C. {a}, R_d D. {a}, {a, a+1}
162	Pick the ODD man out from the following. A. Comparison test B. Cauchy's Root test C. D'Alembert's ratio test D. Leibnitz test

163	The alternating series $\frac{1}{\sqrt{2}+1}-\frac{1}{\sqrt{3}+1}-\frac{1}{\sqrt{4}-1}-\frac{1}{\sqrt{5}+1}+\ldots is:$ A. Convergent B. Absolutely convergent C. Conditionally convergent D. Divergent
164	The series $\sum_{n=1}^{\infty}\frac{1}{(\log n)^{\log n}}$ A. Converges B. Diverges C. May or may not converge D. Oscillates
165	The geometric series $1+x+x^2+\ldots+x^{n-1}+\ldots$ is convergent when – A. $0 \le x \le 1$ B. $x > 1$ C. $-1 < x < +1$ D. $x = 1$

166	Distance between any two distinct real numbers under discrete metric is : A. Unbounded B. Bounded above only C. Bounded below only D. Bounded
167	Choose the WRONG statement: A. A sequence has unique limit in IR B. The sequence $\{n\}_{n=1}^{\infty}$ diverges to infinity C. Every convergent sequence is unbounded D. None of these
168	The following is the nth term of a sequence $\frac{1}{n}+\frac{1}{n+1}+\frac{1}{n+2}+\ldots+\frac{1}{2n-1}$. Then the sequence is : A. Monotonically increasing B. Monotonically decreasing C. Neither increasing nor decreasing D. None of these

169	If f and g are real valued function then max (f, g) is : A. $\frac{\lvert f-g \rvert + f + g}{2}$ B. $\frac{-\lvert f-g \rvert + f + g}{2}$ C. $\frac{\lvert f+g \rvert + f + g}{2}$ D. $\frac{\lvert f+g \rvert + f - g}{2}$
170	Which of the following statements is NOT true? A. The set of rationals is dense in R B. $\left\{1, \frac{1}{2}, \frac{1}{3}, \ldots\ldots \frac{1}{n}, \ldots\right\}$ is not dense in $[0,1]$ C. The discrete metric space R_d has no proper dense subset D. Z – the set of integers dense in R.

171	$\lim_{n\to\infty}\left(1+\frac{1}{n+1}\right)^n = ?$ A. e + 1 B. e C. $\frac{1}{e}$ D. e – 1
172	If d = d(x, y) is a metric on M, which of the following is NOT true? A. $\sqrt{d(x,y)}$ is also a metric on M B. $\frac{d(x,y)}{1+d(x,y)}$ is also a metric on M C. $d^2(x,y)$ is also a metric on M D. min {1, d(x, y)} is also a metric on M

173	Limit point of the set $\left\{1, \frac{1}{2}, \frac{1}{3}, \ldots, \frac{1}{n}, \ldots\right\}$ A. 1 B. $\frac{1}{2}$ C. 0 D. ∞
174	If $\lim_{n\to\infty} x_n = l$, then $\lim_{n\to\infty} \frac{x_1 + x_2 + \ldots + x_n}{n}$ is equal to: A. l B. nl C. $\frac{l}{2}$ D. $2l$

175	The coordinates of the point on the parabola $y = x^2 + 7x + 2$, which is nearest to the straight line $y = 3x - 3$ are : A. (–2, –8) B. (1, 10) C. (2, 20) D. (–1, –4)
176	The value of $\frac{du}{dt}$, given $u = x^2 y^3$, $x = 2t^3$, $y = 3t^2$ is : A. $1926\ t^{11}$ B. $30\ t^{15}$ C. $1296\ t^{11}$ D. $1692t^{11}$

177	The derivative of the function $y = \log_a x^2$ is : A. $\frac{2}{x}$ B. $\frac{1}{x^2}$ C. $\frac{2}{x}\log_a e$ D. $\frac{1}{x^2}\log_a e$
178	$\int_0^1 x^3(1-x)^3 dx = ?$: A. $\frac{1}{140}$ B. $\frac{\pi}{140}$ C. $\frac{\pi}{70}$ D. $\frac{1}{70}$

179	The coefficient of $(x-1)^3$ in the expansion of e^x is : A. $\frac{e}{2}$ B. $\frac{e}{3}$ C. $\frac{e}{6}$ D. $\frac{e^3}{6}$
180	State which is FALSE: A. For $n > 3$, the integers n, n + 2, n +4 cannot be all primes B. GCD (a, a+2) =1 or 2 for every integer a C. $2^{3n} - 1$ is not divisible by 7 for every $n \in N$ D. $n^5 - n$ is divisible by 30 for all $n \in N$

181	The sum of the cubes of any three consecutive natural numbers will always be divisible by – A. 6 B. 9 C. 18 D. More than one of these
182	The vectors $\alpha_1 = (6,2,3,4), \alpha_2 = (0,5,-3,1)$, $\alpha_3 = (0,0,7,-2)$ are: A. Dependent B. Independent C. Data not sufficient D. None of these
183	An example of a perfect number is : A. 8 B. 30 C. 28 D. 48

184	The coefficient of x^n in the expansion $1+\frac{a+bx}{\lfloor 1}+\frac{(a+bx)^2}{\lfloor 2}+\frac{(a-bx)^3}{\lfloor 3}+\ldots\ldots\infty$ is: A. $\frac{a^e n^b}{\lfloor n}$ B. $\frac{e^b a^n}{\lfloor n}$ C. $\frac{e^a n^b}{\lfloor n}$ D. $\frac{e^a b^n}{\lfloor n}$
185	If e_1 is the eccentricity of the conic $9x^2 + 4y^2 = 36$ and e_2 is the eccentricity of the conic $9x^2 - 4y^2 = 36$, then - A. $e_1^2 + e_2^2 = 2$ B. $3 < e_1^2 + e_2^2 < 4$ C. $e_1^2 + e_2^2 > 4$ D. None of these

186	If the sum of the slopes of the lines given by $x^2 - 2cxy - 7y^2 = 0$ is 4 times their product, then c has the value - A. -2 B. -1 C. 2 D. 1
187	The equation of a straight line joining the feet of the perpendicular from the point (1, 0) on the pair of straight lines $2x^2 - 3xy + y^2 = 0$ is : A. $3x + y + 1 = 0$ B. $2x + 3y - 1 = 0$ C. $x - 3y + 1 = 0$ D. None of these

188	The radical axis of two circles is : A. Parallel to the line joining their centres B. Perpendicular to the line joining their centres C. Inclined at an angle 30°to the line joining their centres D. None of these
189	The number of circles of a given radius which touch both the axes is : A. 1 B. 2 C. 3 D. 4
190	The polar of focus of a parabola is : A. x-axis B. y-axis C. Directrix D. Latus rectum

191	A point is such that ratio of its distance from a fixed point and line $x = \frac{9}{2}$ is always 2 : 3, then the locus of the point will be – A. Hyper bola B. Ellipse C. Parabola D. Circle
192	The equation to the pair of straight lines through the origin which are perpendicular to the lines $2x^2 - 5xy + y^2 = 0$ is : A. $2x^2 + 5xy + y^2 = 0$ B. $x^2 + 2y^2 + 5xy = 0$ C. $x^2 - 5xy + 2y^2 = 0$ D. $2x^2 + y^2 - 5xy = 0$

193	The focus of the parabola whose vertex is (3,2) and whose directrix is $x - y + 1 = 0$ is : A. (4, 1) B. (1, −1) C. (8, 7) D. (−4, 1)
194	If the line $y = 2x + c$ be a tangent to the ellipse $\frac{x^2}{8} + \frac{y^2}{4} = 1$, then $c = ?$ A. ± 4 B. ± 6 C. ± 1 D. ± 8
195	The vertex of the cone $9x^2 + 9y^2 - 4z^2 + 12yz - 6zx + 54z - 81 = 0$ is : A. (1, 1, 0) B. (0, 0, 0) C. (1, −2, 3) D. (1, 2, 3)

196	The pair of straight lines $4x^2 + 6xy - y^2 = 0$ is equally Inclined to the pair of straight lines : A. $2x^2 + 2xy + y^2 = 0$ B. $5x^2 - 6xy + y^2 = 0$ C. $x^2 + 3xy + 2y^2 = 0$ D. None of these
197	The plane $x + y + z = 1$ meets the coordinates axes in A, B, C. Then the equation to the cone generated by the lines drawn from origin to meet the circle ABC is : A. $yz + zx + xy = 0$ B. $yz + 2zx + xy = 0$ C. $yz - zx + 2xy = 0$ D. None of these

198	If 'a' and 'c' are the segments of a focal chord of a parabola and 'b' the semi-latus rectum, then – A. a, b, c are in A.P B. a, b, c are in G.P C. a, b, c are in H.P D. None of these
199	The limiting points of the coaxial system of circles determined by $x^2 + y^2 - 6x - 4y + 3 = 0$ and $x^2 + y^2 + 10x + 4y - 1 = 0$ are – A. (1,1) and (1,2) B. (+1,1) and (−1,0) C. (2,1) and (0,1) D. (1,−1) and (1,0)

200	Equation of a circle through origin and belonging to the co-axial system of which the limiting points are (1,2), (4,3) is : A. $x^2 + y^2 - 2x + 4y = 0$ B. $x^2 + y^2 - 8x - 6y = 0$ C. $2x^2 + 2y^2 - x - 7y = 0$ D. $x^2 + y^2 - 6x - 10y = 0$