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(CPG-EE-2017)

Subject: MATHEMATICS

Code			Sr. No. 1012 SET-"A"
Time: 1½ Hours Roll No.	Total Qu (in figure)	uestions : 100	Max. Marks : 100(in words)
Name :		Date of Birth :	
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Date of Examination:			

(Signature of the candidate)

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- All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
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- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. 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 book-let itself. Answers MUST NOT be ticked in the Question book-let.
- 5. Use only Black or Blue <u>BALL POINT PEN</u> of good quality in the OMR Answer-Sheet.
- 6. There will be <u>Negative</u> marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE

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Question No.	Questions		
1.	If matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ -1 & -2 & -3 \end{bmatrix}$, then A^2 is equal to		
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		
2.	If $A = \begin{bmatrix} 0 & 4 & -2 \\ x & 0 & -y \\ 2 & -8 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then $x - y = \dots$ is		
	(1) 8		
	(3) -12 $(4) -8$		
3.	If $3x + 2y + z = 0$; $x + 4y + z = 0$; $2x + y + 4z = 0$, be a system of equations, then		
	(1) It is inconsistent		
	(2) It can be reduced to a single equation and so a solution does not exist.		
	(3) It has only the trivial solution $x = 0$, $y = 0$, $z = 0$		

Question No.	Questions				
4.	The condition that the cubic equation $x^3 - px^2 + qx - r = 0$ has all of its three roots equal is given by				
	(1) $p^2 = 3qr$ (2) $q^2 = 3pr$				
	(3) $r^2 = 3pq$ (4) None of these				
5.	Which of the following is not correct?				
	(1) Every square matrix satisfies its own characteristic equation.				
	(2) If λ is an eigen-value of a matrix A, then $\frac{1}{\lambda}$ is the eigen-value of the matrix A^{-1} .				
	(3) The sum of the eigen-values of a matrix is equal to the sum of elements of principal diagonal.				
	(4) The matrices A and A ^T have different eigen-values.				
6.	Which of the following function f (x) is differentiable at the origin:				
	(1) $f(x) = x $ (2) $f(x) = x^{2/3}$				
	(3) $f(x) = \begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ (4) $f(x) = e^{-\frac{1}{x^2}}$				
7.	The curve $2x^2 - 3xy - 2y^2 = 1$ has two asymptotes that are				
	(1) Perpendicular (2) Parallel				
	(3) Intersect at an angle 60° (4) None of these				

Question No.	Questions			
8.	The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is			
	(1) 2 (2) $\frac{\sqrt{2}}{2}$			
	(3) $2\sqrt{2}$ (4) $\sqrt{2}$			
9.	For the curve $y^2 (1 + x) = x^2 (1 - x)$, the origin is a			
	(1) Cusp (2) Point of inflexion			
	(3) Node (4) None of these			
10.	The area of surface of the solid generated by the revolution of the line segment $y = 2x$ from $x = 0$ to $x = 2$, about x-axis is equal to			
	(1) $\pi \sqrt{5}$ (2) $2\pi \sqrt{5}$			
	(3) $4\pi\sqrt{5}$ (4) $8\pi\sqrt{5}$			
11.	The centre of the sphere $x^2 + y^2 + z^2 - 4x + 6y - 8z + 4 = 0$ is			
	$(1) (2, -3, 4) \qquad (2) (-2, 3, -4)$			
	$(3) (-4, 6, -8) \qquad \qquad (4) (4, -6, 8)$			
12.	The equation of the right circular cone whose axis is $x = y = z$, vertex is the origin and the semi-vertical angle is 45° is given by			
	(1) $(x^2 + y^2 + z^2) = 3(x + y + z)^2$ (2) $2(x + y + z)^2 = 21(x^2 + y^2 + z^2)$			
	(3) $3(x^2 + y^2 + z^2) = 2(x + y + z)^2$ (4) $x^2 + y^2 + z^2 = \frac{1}{2}$			

Question No.	Questions				
13.	The	e equation of the cylinder,	whos	e gene	erators are parallel to the line
	$\frac{x}{1} =$	$\frac{y}{-2} = \frac{z}{3}$ and whose guiding	curv	e is th	ne ellipse $x^2 + 2y^2 = 1$, $z = 0$ is
	give	en by			
	(1)	$(3z - x)^2 + 2(2z + 3y)^2 = 9$	(2)	(3x –	$(z)^2 + 2(3y + 2z)^2 = 9$
	(3)	$(3x + z)^2 + 2 (3y - 2z)^2 = 9$	(4)	None	e of these
14.	The	e equation of the tangent to	the p	arabol	$a y^2 + 4y + 20x = 0$ at $(0, 0)$ is
	(1)	y = 2x	(2)	y = 5	x
	(3)	x - 5y = 0	(4)	y + 5	x = 0
15.	The	e equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{2z}{c}$, repr	resen	ts	
	(1)	Hyperboloid of one sheet	(2)	Ellip	tic Paraboloid
	(3)	Hyperbolic Paraboloid	(4)	Ellip	soid
16.	(n ⁷	– n) is divisible by			
	(1)	1	(2)	7	
	(3)	30	(4)	42	
17.	Cor	$igruence 33x \equiv 22 \pmod{11} $	nas		
	(1)	3 solutions	(2)	11 so	lutions
	(3)	6 solutions	(4)	9 sol	utions
18.	Ifp	is a prime number and 'a' de	enote	s an ir	nteger such that $(a, p) = 1$, then
		$a^{p-1} \equiv 1 \pmod{p}$			
	isk	nown as			
	(1)	Fermat's Theorem		(2)	Wilson's Theorem
part of	(3)	Chinese Remainder Theor	em	(4)	None of these

Question No.	Questions
19.	The value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is
	(1) 1 (2) 0
	(3) $\cos 10 \theta + i \sin 10 \theta$ (4) $\cos 2\theta + i \sin 2\theta$
20.	Which is not correct?
	(1) $\sin(ix) = i \sinh x$ (2) $\operatorname{sech} \theta = \frac{2}{e^{\theta} - e^{-\theta}}$
	(3) $\tanh \theta = \frac{e^{\theta} - e^{-\theta}}{e^{\theta} + e^{-\theta}}$ (4) $\cosh^2 x - \sinh^2 x = 1$
21.	Solution of differential equation $(y - px)^2 = 1 + p^2$, is
	(1) $y = cx^2 + \sqrt{1-p^2}$ (2) $y = px + \sqrt{1+p^2}$
	(3) $y = px - tan^{-1}c$ (4) $y = cx + \sqrt{1+c^2}$, is constant
22.	P dx + x sin y dy = 0 is exact, then $P can be$
	$(1) \sin y + \cos y \qquad (2) - \sin y$
	$(3) x^2 - \cos y \qquad \qquad (4) \cos y$
23.	The general solution of the differential equation $(D^2 + 6D + 9) y = 5 e^{2x}$ is
	(1) $y = (c_1 + c_2 x) e^{3x} + 5 e^{2x}$ (2) $y = (c_1 + c_2 x) e^{-3x} + \frac{1}{5} e^{2x}$
	(3) $y = (c_1 + c_2 x) e^{-3x} + e^{2x}$ (4) $y = (c_1 + c_2 x) e^{3x} + \frac{e^{2x}}{3}$

Question No.	Questions
24.	The solution of the differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ is
	(1) $y = (c_1 + c_2 \log x) x^2$ (2) $y = (c_1 + c_2 x) e^{2x}$
	(3) $y = c_1 x^2 + \frac{c_2}{x}$ (4) $y = (c_1 + c_2 x) e^{-x}$
25.	The orthogonal trajectory of family of curves $y = ax^2$ is
	(1) $x^2 + y^2 = a^2$ (2) $x^2 + 2y^2 = a^2$
	(3) $2x^2 + y^2 = a^2$ (4) $\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$
26.	If the vectors $2\hat{\mathbf{i}} - \hat{\mathbf{j}} + \hat{\mathbf{k}}$; $\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$ and $3\hat{\mathbf{i}} + a\hat{\mathbf{j}} + 5\hat{\mathbf{k}}$ be coplanar, then the value of a is given by
	(1) 1 (2) -2
	(3) -3 $(4) -4$
27.	The value of λ so that the vector $\vec{F} = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (x + \lambda z)\hat{k}$ is a solenoidal vector, is given by
	(1) 2 (2) 3
	(3) -2 $(4) 1$
28.	Which is not correct? (Here r, θ , z are cylindrical coordinates and \hat{e}_r , \hat{e}_{θ} , \hat{e}_z are unit vectors in these coordinates),
	(1) $\frac{d}{dt} \hat{e}_{r} = \dot{\theta} \hat{e}_{\theta}$ (2) $\frac{d}{dt} \hat{e}_{\theta} = -\dot{\theta} \hat{e}_{r}$ (3) $\hat{e}_{r} = \cos \theta \hat{i} + \sin \theta \hat{j}$ (4) $\hat{e}_{\theta} = \cos \theta \hat{i} - \sin \theta \hat{j}$
	(3) $\hat{\mathbf{e}}_{r} = \cos\theta \hat{\mathbf{i}} + \sin\theta \hat{\mathbf{j}}$ (4) $\hat{\mathbf{e}}_{\theta} = \cos\theta \hat{\mathbf{i}} - \sin\theta \hat{\mathbf{j}}$

Question No.	Questions
29.	If $\vec{R} = x \hat{i} + y \hat{j} + z \hat{k}$, and if S is closed surface enclosing a volume V, where \hat{n} is the outward drawn unit-normal vector to the surface S, then $\iint_S \vec{R} \cdot \hat{n} dS \text{ is equal to}$
	(1) 4V (2) 3V
	(3) 2V (4) V
30.	Stoke's theorem is a relation between
	(1) Line integral and Surface integral
	(2) Line integral and Volume integral
	(3) Surface integral and Volume integral
	(4) None of these
31.	If $x = a (\theta - \sin \theta)$; $y = a (1 - \cos \theta)$, then the value of $\frac{dy}{dx}$ will be
	(1) $\tan \frac{\theta}{2}$ (2) $\tan \theta$
	(3) $\cot \frac{\theta}{2}$ (4) $\cot \theta$
32.	Let $f(x) = \sqrt{x^2 - 4}$, $x \in [2, 4]$, then which of the following is true for $f(x)$?
	(1) Roll's Theorem is applicable
	(2) Lagrange's Mean Value Theorem is applicable
	(3) There exists at least one $C = 2\sqrt{3}$ in $(2, 4)$
	(4) All the above are true.

	Questions
$\lim_{a \to b} \frac{a^b - b^a}{a^a - b^b} \text{ is}$	
$(1) \frac{1 - \log b}{1 + \log b}$	$(2) \frac{1 - \log b}{1 + \log a}$
(3) $\log \frac{a}{b}$	(4) None of these
If $u = \log\left(\frac{x^2 + y^2}{x + y}\right)$, then	$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is equal to
(1) 0	(2) u
(3) 1	(4) e ^u
Which is not correct? (vidifferential geometry).	where symbols have their usual meanings
$(1) \frac{d\vec{t}}{ds} = k\vec{n}$	$(2) \frac{d\vec{b}}{ds} = -\tau \vec{n}$
(3) $\frac{d\vec{n}}{ds} = \tau \vec{b} - k \vec{t}$	$(4) \vec{r}' \cdot \vec{r}''' = k^2$
The particular integral of	$(D^2 - 2DD') z = \sin(x + 2y) is$
$(1) \frac{1}{6} \sin (x + 2y)$	(2) $\frac{1}{3} \sin (x + 2y)$
(3) $\frac{1}{6}\cos(x + 2y)$	(4) None of these
	(1) $\frac{1 - \log b}{1 + \log b}$ (3) $\log \frac{a}{b}$ If $u = \log \left(\frac{x^2 + y^2}{x + y}\right)$, then (1) 0 (3) 1 Which is not correct? (vidifferential geometry). (1) $\frac{d\vec{t}}{ds} = k\vec{n}$ (3) $\frac{d\vec{n}}{ds} = \tau \vec{b} - k \vec{t}$ The particular integral of (1) $\frac{1}{6} \sin (x + 2y)$

Question No.	Questions		
37.	The partial differential equation $\frac{\partial^2 z}{\partial x^2} - 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0 \text{is}$		
	(1) Parabolic (2) Hyperbolic (3) Elliptic (4) None of these		
38.	The characteristic equations of $\frac{\partial^2 u}{\partial x^2} - 2 \frac{\partial^2 u}{\partial x \partial y} - 8 \frac{\partial^2 u}{\partial y^2} = 0$ are given by		
	(1) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} - 4 = 0$ (2) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} + 4 = 0$ (3) $dy + 2 dx = 0$ and $dy - 4 dx = 0$ (4) None of these		
39.	The equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$ is called (1) One dimensional heat equation (2) Two dimensional heat equation (3) Two dimensional wave equation (4) Laplace equation		
40.	Solution of yp - xq = y² - x² is (1) $\phi(x^2 + y^2, xy - z) = 0$ (2) $\phi(xy, x^2 + y^2 + z^2) = 0$ (3) $\phi\left(\frac{1}{x} - \frac{1}{y}, \frac{x - y}{z}\right) = 0$ (4) None of these		

Question No.	Questions
41.	The resultant of two forces P and Q act at right angles to P, the angle between the forces is
	(1) $\cos^{-1}\left(-\frac{P}{Q}\right)$ (2) $\tan^{-1}\left(-\frac{P}{Q}\right)$
	(3) $\sin^{-1}\left(-\frac{Q}{P}\right)$ (4) $\cos^{-1}\left(\frac{P}{Q}\right)$
42.	Three forces 2P, 3P and 4P act at a point in direction parallel to the sides of an equilateral triangle taken in order. Magnitude of the resultant is
	(1) 3P (2) 2P
	(3) $\sqrt{17} \text{ P}$ (4) $\sqrt{3} \text{ P}$
43.	If the normal reaction is 10 units and limiting friction is 5 units, then the coefficient of friction is
	(1) 2 (2) $\frac{2}{3}$
	(3) $\frac{1}{2}$ (4) None of these
44.	Suppose a system of forces is reduced to a single force \vec{R} and a Couple of
	moment \vec{k} whose axis coincides with the direction of acting force, then \vec{R} and \vec{k} taken together are called
	(1) Null line (2) Wrench
	(3) Pitch (4) None of these

Question No.	Questions
45.	The condition that the straight line $\frac{x-f}{\ell} = \frac{y-g}{m} = \frac{z-h}{n}$ may be a null lift for the system of forces (X, Y, Z; L, M, N) is
	X Y Z
	(1) $ \begin{vmatrix} X & Y & Z \\ \ell & m & n \\ f & g & h \end{vmatrix} = L\ell + Mm + Nn $
	f g h
	x y z
1 3 3	$ \begin{vmatrix} x & y & z \\ \ell & m & n \end{vmatrix} = -(L\ell + Mm + Nn) $ $ \begin{vmatrix} X & Y & Z \end{vmatrix} $
	X Y Z
	(3) Lx + My + Nz = 0
	(4) None of these
46.	The greatest lower bound of $\left\{ \left(1 + \frac{1}{n}\right)^n \right\}$ is
	(1) 0 (2) 2
	(3) 1 (4) None of these
47.	The sequence $\left\{\frac{2n-7}{3n+2}\right\}$ is
	(1) Monotonic increasing, and is bounded.
	(2) Monotonic decreasing, and is bounded.
1	(3) Monotonic increasing and is not bounded.
	(4) Monotonic decreasing and is not bounded.

Question No.	Questions				
48.	The series whose n th term is $(\sqrt{n^3+1}-\sqrt{n^3})$ is				
	(1) Divergent (2) Convergent				
	(3) Oscillatory (4) None of these				
49.	If $\sum u_n$ is a series of positive terms and if $\lim_{n\to\infty} (u_n)^{1/n} = \ell$, then the series is divergent if				
	$(1) \ell > 1 \qquad (2) \ell < 1$				
	(3) $\ell \le 1$ (4) None of these				
50.	"A series obtained from an absolutely convergent series by a rearrangement of terms converges absolutely and has the same sum as the original series", is statement of a theorem known as (1) Riemann's rearrangement theorem (2) Dirichlet's theorem (3) Pringsheim's theorem (4) Cauchy's theorem				
51.	The value of Bessel's function $J_{\frac{1}{2}}$ (x) is given by				
	(1) $\sqrt{\frac{2}{\pi x}} \sin x$ (2) $\sqrt{\frac{2}{\pi x}} \cos x$				
	(3) $\sqrt{\frac{\pi x}{2}} \sin x$ (4) None of these				
	If P _n (x) is Legendre polynomial, then which of the following is not correct?				
52.	If P _n (x) is Legendre polynomial, then which of the following is not correct?				
52.					

Question No.	Questions
53.	The value of $\int_{-1}^{+1} P_n^2(x) dx$ is equal to
	(1) 0 (2) $\frac{2}{2n+1}$
	(3) $\frac{2}{n+1}$ (4) 1
54.	Inverse Laplace transform of $\left[\frac{s^2 - a^2}{(s^2 + a^2)^2}\right]$ is
	(1) t sin at (2) t cosh at
	(3) t cos at (4) t sinh at
55.	If $F_s(s)$ and $F_c(s)$ are Fourier sine and cosine transforms of $f(t)$ respectively, then which is correct?
	(1) $F_s[f(t)\cos at] = \frac{1}{2}[F_s(s+a) + F_s(s-a)]$
	(2) $F_s[f(t)\cos at] = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$
	(3) $F_s[f(t) \sin at] = \frac{1}{2} [F_s(s+a) + F_s(s-a)]$
	(4) None of these
56.	Which of the following symbols in C - Language represents logical operator?
2 367	(1) == (2) &&
	(3) % (4) >=

Question No.			Ques	tions	
57.	The purpose of strrev () function in C – Language is to				
	(1)	Compare two strings	(2)	Find length of a string	
	(3)	Reverse the string	(4)	Copy one string over the other.	
58.	Wh	ich of the following is an u	ncondi	tional control transfer statement?	
	(1)	if statement	(2)	goto statement	
	(3)	if-else statement	(4)	switch statement	
59.	Wh	ich of the following statem	ent is	incorrect?	
	(1)	while (condition) {	(2)	do {	
		statement(s);		statement(s);	
		}		} while (condition);	
	(3)	switch (expression)			
		{			
		case exp 1:	•		
		statement block-1			
		break;			
		case exp 2:			
		statement block-2			
		break;			
		default:			
		default block			
		}			
		statement t;			
	(4)	None of these			

Question No.	Questions				
60.	To send the value of variable using pointers is known as				
	(1) Recursion (2) Call by reference				
	(3) Getw function (4) None of these				
61.	If a function f be bounded on [a, b], then				
	(1) f is necessarily R-integrable				
	(2) f is R-integrable if $[a, b] \subset N$				
	(3) f is not necessarily R-integrable				
	(4) f is R-integrable if [a, b] = $N \cup \phi$				
62.	If f be a monotonic function, then				
	(1) f be R-integrable (2) f be R-integrable if $f \neq 0$				
	(3) f be bounded (4) All the above				
63.	If f is integrable on [a, b] and F is the primitive of f on [a, b], then				
	$\int_{a}^{b} f dx = F(b) - F(a) \text{ is statement of}$				
	(1) First Mean Value theorem				
	(2) Fundamental theorem of integral calculus				
	(3) Baire's Category theorem				
	(4) None of these				
64.	The integral $\int_{0}^{\pi/2} \frac{\sin x}{x^n} dx$ converges if				
	(1) $n < 1$ (2) $n > 1$				
	(3) $n > 2$ (4) $n < 2$				

Question No.	Questions				
65.	If on a non-empty set X, $d: X \times X \to R$ be a function such that $d(x, y) = \begin{cases} 0 & \text{if } x = y \\ 1 & \text{if } x \neq y \end{cases}, \text{ then}$				nat
	(1) (X, d) is a	semi-metric space	(2)	(X, d) is a metr	ic-space
	(3) (X, d) is no	ot a metric-space	(4)	None of these	
66.	The derived set for the set $S = \left\{\frac{1}{n}; n \in N\right\}$ is				
	(1) R	(2)	N		
	(3) {0}	(4)	{0, ∞	}	
67.	The statement "Every complete metric space is of the second category as a subset of itself" refers to				
	(1) Baire's Ca	tegory Theorem			
	(2) Cantor's intersection Theorem				
	(3) Bolzano-Weierstrass property				
	(4) None of th	nese			
68.	The set $G = \{1, w, w^2\}$, where w is a cube root of unity, with respect to multiplication is a				
	(1) Group	(2)	Abel	ian group	
	(3) Cyclic gro	up (4)	Allo	f these	
69.	If H and K are two non-empty subsets of abelian group G, then HK is a subgroup of G if				
	(1) H is a sub	group of G			
	(2) K is a sub	group of G			
	(3) H ∩ K is s	subgroup of G			
	(4) Has well	as K are subgroups o	of G.		

Question No.	Questions						
70.	If p is a prime, then any group G of order 2p has						
	(1) a normal subgroup of order p						
	(2) a normal subgroup of	of order 2p					
	(3) a normal subgroup o	of order p ²					
	(4) None of these						
71.	Cayley's theorem states t	hat					
	(1) Every finite group is	isomorph	ic to a permutation group				
	(3) Every subgroup of a cyclic group is cyclic						
			a finite group is a divisor of the orde				
72.	The ring of even integers i	is also a					
	(1) Field	(2)	Integral domain				
	(3) Division ring	(4)	Commutative ring				
73.	A division ring has at least elements.						
	(1) 1	(2)	2				
	(3) 3	(4)	None of these				
	The number of trivial subgroups of a cyclic group of order 8 is						
74.							
	(1) 0	(2)	1				

Question No.	Questions			
75.	The transverse component of acceleration is given by			
	(1) $\frac{1}{r} \frac{d}{dt} \left(r^2 \frac{d\theta}{dt} \right)$ (2) $\frac{d^2r}{dt^2} - r \left(\frac{d\theta}{dt} \right)^2$			
	(3) $\frac{d^2r}{dt^2} + r\left(\frac{d\theta}{dt}\right)^2$ (4) $r\frac{d^2\theta}{dt^2} - 2\frac{dr}{dt}\frac{d\theta}{dt}$			
76.	A particle executing a S.H.M. has acceleration 8 cm/sec ² when it is at a distance 2 cm from the centre. The time period will be			
	(1) $\frac{2}{\pi}$ sec. (2) $\frac{1}{\pi}$ sec.			
j (1)	(3) $\frac{\pi}{2}$ sec. (4) π sec.			
77.	A man while going on a scooter with a speed of 10 m/sec, a child on the road and brings the scooter to stop, 4 seconds just in time to save the child. If the weight of the scooter together with the man is 200 kg, what retarding force was applied on the scooter?			
	(1) 300 N (2) 400 N			
	(3) 500 N (4) 600 N			
78.	If the greatest height attained by a projectile be equal to the horizontal range, then the angle of projection is given by			
	(1) $\tan^{-1}\left(\frac{1}{4}\right)$ (2) $\tan^{-1}4$			
	(3) $\tan^{-1} 2$ (4) $\tan^{-1} \left(\frac{1}{2}\right)$			

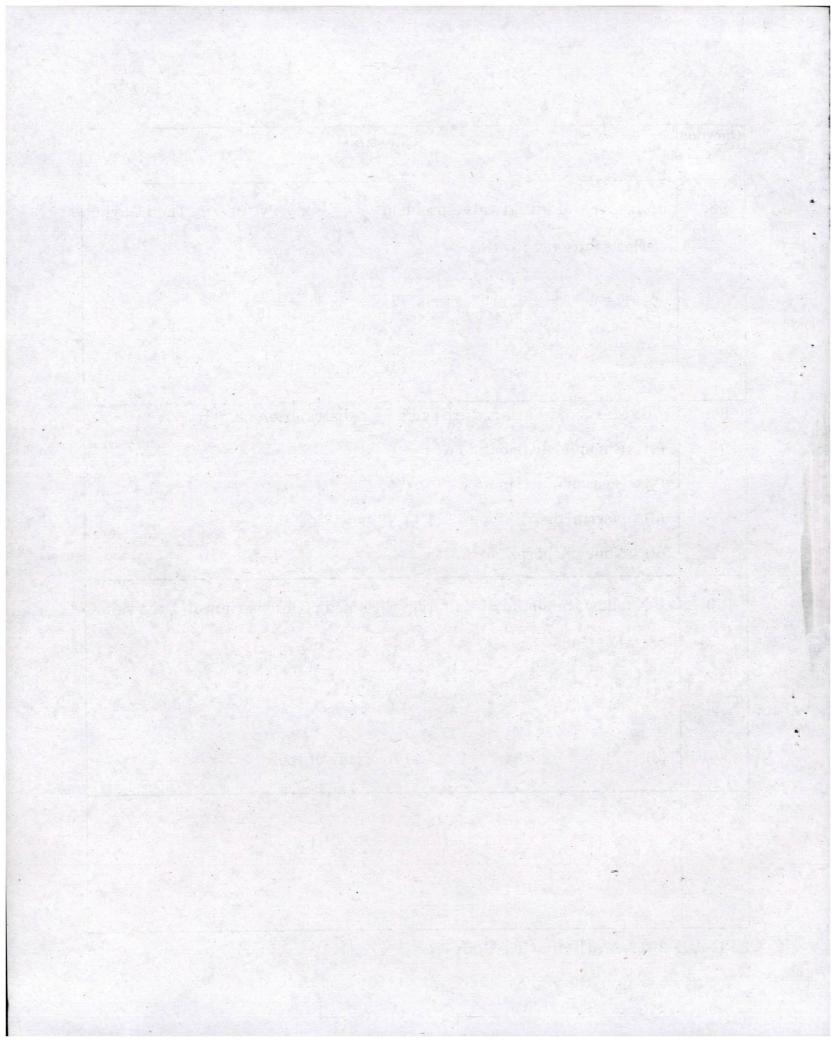
Question No.	Questions	
79.	The differential equation of a central orbit under P as central force per unit mass, in polar form is given by : (Here $u = \frac{1}{r}$ and h is constant).	
	(1) $P = h^2 u^2 \left[u + \frac{d^2 u}{d\theta^2} \right]$ (2) $P = h^2 u^2 \left[u + \left(\frac{du}{d\theta} \right)^2 \right]$	
	(3) $P = h^2 \left[u^2 + \left(\frac{du}{d\theta} \right)^2 \right]$ (4) None of these	
80.	Which is not correct? (1) Relative to the sun, the planets describe ellipses with the sun as one focus.	
	 (2) The radius vector drawn from the sun to a planet sweeps out areas at a constant rate (3) The square of the periodic times are proportional to the semi-major axis of the elliptic orbits and hence also to the mean distances from 	
	the sun. (4) If a particle moves under the action of a conservative system of forces, the sum of its kinetic and potential energies remain constant throughout the motion.	
81.	If $u = x + y$, and $v = (x + y)^2$, then value of $\frac{\partial (u, v)}{\partial (x, y)}$ is	
	(1) 0 (2) $4(x+y)^2$ (3) x (4) $\frac{1}{x}$	
82. The value of Beta function $\beta\left(\frac{1}{2},\frac{1}{2}\right)$ is		
	$(1) \sqrt{2\pi} \qquad \qquad (2) \pi \sqrt{2}$	
- 100	(3) $\sqrt{\pi}$ (4) π	

Question No.	Questions				
83.	The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is given by				
	(1)	πab	(2)	2π ab	
	(3)	π a² b	(4)	π ab ²	
84.	The Fourier series for the function $f(x) = x , -\pi \le x \le \pi$ contains				
	(1)	only sine terms	(2)	only cosine terms	
	(3)	both sine and cosine terms	(4)	None of these	
85.	The	Harmonic conjugate of u (x,	y) =	$= \frac{y}{x^2 + y^2}$ is	
	(1)	$\frac{x}{x^2 + y^2}$	(2)	$\frac{-x}{x^2 + y^2}$	
	(3)	$\frac{1}{x^2 + y^2}$	(4)	$x^2 - y^2$	
86.	The	fixed points of the mapping	w =	$\frac{(5Z+4)}{(Z+5)} \text{ are}$	
	(1)	2, 2	(2)	-2, -2	
	(3)	2, -2	(4)	None of these	
87.	7. The bilinear transformation that maps the points $z = \infty$ points $w = 0$, i and ∞ is given by		naps the points $z = \infty$, i, 0 into the		
	(1)	$\mathbf{w} = \mathbf{z}$	(2)	$\mathbf{w} = -\mathbf{z}$	
	(3)	$w = \frac{1}{z}$	(4)	$w = -\frac{1}{z}$	

Question No.	Questions					
88.	For a non-empty subset W of a vector space V(F), which of the following is incorrect?					
	(1) W be subspace if $u - v \in W$, a $u \in W$ for $u, v \in W$, $a \in F$					
	(2) W be subspace iff $au + bv \in W$ for $u, v \in W$; $a, b \in F$					
	(3) The union of any two subspaces of V(F) is a subspace					
	(4) None of these					
89.	Which of the following set form the basis of R ³ :					
	$(1) \{(2, 3, 1), (7, -6, 17), (5, 2, 7)\} (2) \{(2, 1, 4), (1, -1, 2), (3, 1, -2)\}$					
	(3) $\{(1, -1, 3), (1, 2, -3), (1, 0, 1)\}$ (4) None of these					
90.	Which of the following functions T from $V_2(R)$ into $V_2(R)$ is not a linear transformation?					
	(1) $T(x, y) = (y, x)$ (2) $T(x, y) = (x + y, x)$					
	(3) $T(x, y) = (x - y, y - x)$ (4) $T(x, y) = (1 + x, y)$					
91.						
	With respect to standard basis vectors, a linear transformation					
	With respect to standard basis vectors, a linear transformation $T: I \ R^4 \to I R^3 \ \text{is given by the matrix} \begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$					
	$T: I R^4 \to IR^3$ is given by the matrix $\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$					
	$T: I R^4 \to IR^3$ is given by the matrix $\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$ The dimension of Ker (T) is					
92.	The dimension of Ker (T) is (1) 1 (2) 2					
	$T: I R^4 \to IR^3$ is given by the matrix $\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$ The dimension of Ker (T) is (1) 1 (2) 2 (3) 3 (4) 4					

Question No.	Questions
93.	Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statements implies that T is bijective?
	 (1) Rank (T) - Nullity (T) = n (2) Rank (T) + Nullity (T) = n (3) Rank (T) = Nullity (T) = n (4) None of these
94.	Let V be an inner product space, then $ <$ u, $v>$ $ \le$ $ u . v $ for all u, $v \in \dot{V}$, is known as
	 (1) Bessel's Inequality (2) Cauchy Schwarz inequality (3) Triangle inequality (4) None of these
95.	Given that $\begin{array}{ c c c c c c c c c c c c c c c c c c c$
	(1) 3 (2) 9
	(3) 5 (4) 2
96.	The order of convergence of Regula-Falsi method is
	(1) 2 (2) 1.5
	(3) 1.618 (4) 2.98
97.	f (x) is given by $\begin{array}{ c c c c c c c c c c c c c c c c c c c$
	rule, the value of $\int_{0}^{2} f(x) dx$ is
	(1) 1.075 (2) 1.575
	(3) 0.775 (4) 2.150

Quest	Questions		
Consider the initial value problem	$\frac{dy}{dx} = -x y ; y (0) = 1. Then Taylor$		
series solution upto x ⁴ is			
(1) $y = 1 + \frac{x^2}{2} + \frac{x^4}{8}$ (2)	$y = x + \frac{x^2}{2} + \frac{x^4}{6}$		
(3) $y = 1 + \frac{x^3}{6} + \frac{x^4}{8}$ (4)	None of these		
The Mean and Variance are same for	a distribution namely :		
(1) Binomial distribution			
(2) Poisson's distribution			
(3) Normal distribution			
(4) None of these			
If X follows binomial distribution wit	h mean 3 and variance $\frac{3}{2}$, the value		
of P ($X \le 5$) is	2		
(1) $\frac{1}{64}$ (2)	$\frac{1}{8}$		
(3) $\frac{63}{64}$ (4)	None of these		
	Consider the initial value problem series solution upto x^4 is (1) $y = 1 + \frac{x^2}{2} + \frac{x^4}{8}$ (2) (3) $y = 1 + \frac{x^3}{6} + \frac{x^4}{8}$ (4) The Mean and Variance are same for (1) Binomial distribution (2) Poisson's distribution (3) Normal distribution (4) None of these If X follows binomial distribution with of P (X \leq 5) is (1) $\frac{1}{64}$ (2)		



(Total No. of printed pages: 24)

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(CPG-EE-2017)

Subject: MATHEMATICS

10150

(Signature of the candidate)

(Signature of the Invigilator)

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- All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
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- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. 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 book-let itself. Answers MUST NOT be ticked in the Question book-let.
- 5. Use only Black or Blue <u>BALL POINT PEN</u> of good quality in the OMR Answer-Sheet.
- 6. There will be <u>Negative</u> marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

EXAMINATION, 18PM pur MIGHT

Aldential Confidence

Question No.	Questions				
1.	The centre of the sphere $x^2 + y^2 + z^2 - 4x + 6y - 8z + 4 = 0$ is				
	$(1) (2, -3, 4) \qquad (2) (-2, 3, -4)$				
ion i	$(3) (-4, 6, -8) \qquad \qquad (4) (4, -6, 8)$				
2.	The equation of the right circular cone whose axis is $x = y = z$, vertex is				
	the origin and the semi-vertical angle is 45° is given by				
	(1) $(x^2 + y^2 + z^2) = 3 (x + y + z)^2$ (2) $2 (x + y + z)^2 = 21 (x^2 + y^2 + z^2)$				
	(3) $3(x^2 + y^2 + z^2) = 2(x + y + z)^2$ (4) $x^2 + y^2 + z^2 = \frac{1}{2}$				
3.	The equation of the cylinder, whose generators are parallel to the line				
	$\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and whose guiding curve is the ellipse $x^2 + 2y^2 = 1$, $z = 0$ is				
	given by				
	(1) $(3z - x)^2 + 2(2z + 3y)^2 = 9$ (2) $(3x - z)^2 + 2(3y + 2z)^2 = 9$				
	(3) $(3x + z)^2 + 2(3y - 2z)^2 = 9$ (4) None of these				
4.	The equation of the tangent to the parabola $y^2 + 4y + 20x = 0$ at $(0, 0)$ is				
	(1) $y = 2x$ (2) $y = 5x$				
	(3) $x - 5y = 0$ (4) $y + 5x = 0$				
5.	The equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{2z}{c}$, represents				
	(1) Hyperboloid of one sheet (2) Elliptic Paraboloid				
	(3) Hyperbolic Paraboloid (4) Ellipsoid				
6.	$(n^7 - n)$ is divisible by				
	(1) 1 (2) 7				
	(3) 30 (4) 42				

Question No.	Questions					
7.	Congruence $33x \equiv 22 \pmod{11}$ has					
	(1) 3 solutions (2)	11 solutions				
	(3) 6 solutions (4)	9 solutions				
8.	If p is a prime number and 'a' denotes an integer such that $(a, p) = 1$, then $a^{p-1} \equiv 1 \pmod{p}$ is known as					
	(1) Fermat's Theorem	(2) Wilson's Theorem				
	(3) Chinese Remainder Theorem	(4) None of these				
9.	The value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is					
	(1) 1 (2)	0				
		$\cos 2\theta + i \sin 2\theta$				
10.	Which is not correct?					
	(1) $\sin(ix) = i \sinh x$ (2)	$\operatorname{sech} \theta = \frac{2}{e^{\theta} - e^{-\theta}}$				
	(3) $\tanh \theta = \frac{e^{\theta} - e^{-\theta}}{e^{\theta} + e^{-\theta}}$ (4)	$\cosh^2 x - \sinh^2 x = 1$				
11.	With respect to standard basis vectors, a linear transformation					
	$T: I \mathbb{R}^4 \to I\mathbb{R}^3$ is given by the matrix	$\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$				
	The dimension of Ker (T) is					
	(1) 1 (2)	2				
	(3) 3 (4)	4				

Question No.	Questions
12.	The norm of x with respect to inner product space $\langle x, x \rangle$ is given by
	(1) $ x = \langle x, x \rangle$ (2) $ x = \langle x, x \rangle^2$
	(3) $ x ^2 = \langle x, x \rangle$ (4) None of these
13.	Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statements implies that T is bijective?
. 4.1	(1) Rank (T) – Nullity (T) = n (2) Rank (T) + Nullity (T) = n
14.1	(3) Rank (T) = Nullity (T) = n (4) None of these
14.	Let V be an inner product space, then $ < u, v> \le u . v $ for all $u, v \in V$, is known as
	(1) Bessel's Inequality (2) Cauchy Schwarz inequality
	(3) Triangle inequality (4) None of these
15.	Given that $\begin{bmatrix} x : & 1 & 2 & 3 & 4 & 5 \\ y : & 2 & 5 & 10 & 17 & 26 \end{bmatrix}$, the value of $\nabla^2 y_5$ is
	(1) 3 (2) 9
	(3) 5 (4) 2
. 16.	The order of convergence of Regula-Falsi method is
	(1) 2 (2) 1.5
	(3) 1.618 (4) 2.98
17.	f (x) is given by
	rule, the value of $\int_{0}^{2} f(x) dx$ is
	(1) 1.075 (2) 1.575
	(3) 0.775 (4) 2.150

Question No.	Questions				
18.			blem	$\frac{dy}{dx} = -x y$; y (0) = 1. Then Taylor	
		es solution upto x4 is			
	(1)	$y = 1 + \frac{x^2}{2} + \frac{x^4}{8}$	(2)	$y = x + \frac{x^2}{2} + \frac{x^4}{6}$	
	(3)	$y = 1 + \frac{x^3}{6} + \frac{x^4}{8}$	(4)	None of these	
19.	The	Mean and Variance are sa	me fo	r a distribution namely:	
	(1)	Binomial distribution			
	(2)	Poisson's distribution			
	(3)	Normal distribution			
	(4)	None of these			
20.	If X follows binomial distribution with mean 3 and variance $\frac{3}{2}$, the value				
	of P	$Y(X \le 5)$ is			
	(1)	$\frac{1}{64}$	(2)	$\frac{1}{8}$	
	(3)	63 64	(4)	None of these	
21.	Cayley's theorem states that				
	(1) Every finite group is isomorphic to a permutation group				
	(1)	Every finite group is ison	•	병원 가입하다 하고 이 시간을 사용하다 하면 있다고 말했다고 하고 있는 것 같아 없었다.	
	(1) (2)	Every finite group is ison Every finite group is ison			
			norph	ic to a quotient group	

Question No.		Questions			
22.	The ring of even integers is also a				
	(1)	Field	(2)	Integral domain	
	(3)	Division ring	(4)	Commutative ring	
23.	Ad	ivision ring has a	t least ele	ments.	
10.51	(1)	1	(2)	2	
	(3)	3	(4)	None of these	
24.	The	number of trivia	l subgroups of a	cyclic group of order 8 is	
	(1)		(2)		
	(3)	2	(4)	3	
25.	The	transverse comp	onent of acceler	eation is given by	
	(1)	$\frac{1}{r}\frac{d}{dt}\bigg(r^2\frac{d\theta}{dt}\bigg)$	(2).	$\frac{d^2r}{dt^2} - r\left(\frac{d\theta}{dt}\right)^2$	
	(3)	$\frac{d^2r}{dt^2} + r\left(\frac{d\theta}{dt}\right)^2$	(4)	$r\frac{d^2\theta}{dt^2} - 2\frac{dr}{dt}\frac{d\theta}{dt}$	
26.	A particle executing a S.H.M. has acceleration 8 cm/sec ² when it is at a distance 2 cm from the centre. The time period will be				
	(1)	$\frac{2}{\pi}$ sec.	(2)	$\frac{1}{\pi}$ sec.	
	(3)	$\frac{\pi}{2}$ sec.	(4)	π sec.	
27.	A man while going on a scooter with a speed of 10 m/sec, a child on the road and brings the scooter to stop, 4 seconds just in time to save the child. If the weight of the scooter together with the man is 200 kg, what retarding force was applied on the scooter?				
	(1)	300 N	(2)	400 N	
	(3)	500 N	(4)	600 N	

Question No.	Questions			
28.	If the greatest height attained by a projectile be equal to the horizontal range, then the angle of projection is given by			
	(1) $\tan^{-1}\left(\frac{1}{4}\right)$ (2) $\tan^{-1}4$			
	(3) $\tan^{-1} 2$ (4) $\tan^{-1} \left(\frac{1}{2}\right)$			
29.	The differential equation of a central orbit under P as central force per			
	unit mass, in polar form is given by : (Here $u = \frac{1}{r}$ and h is constant).			
	(1) $P = h^2 u^2 \left[u + \frac{d^2 u}{d\theta^2} \right]$ (2) $P = h^2 u^2 \left[u + \left(\frac{du}{d\theta} \right)^2 \right]$			
	(3) $P = h^2 \left[u^2 + \left(\frac{du}{d\theta} \right)^2 \right]$ (4) None of these			
30.	Which is not correct?			
	(1) Relative to the sun, the planets describe ellipses with the sun as one focus.			
	(2) The radius vector drawn from the sun to a planet sweeps out areas at a constant rate			
	(3) The square of the periodic times are proportional to the semi-major axis of the elliptic orbits and hence also to the mean distances from the sun.			
	(4) If a particle moves under the action of a conservative system of forces, the sum of its kinetic and potential energies remain constant throughout the motion.			

Question No.	Questions	
31.	The value of Bessel's function $J_{\frac{1}{2}}$ (x) is given by	
	(1) $\sqrt{\frac{2}{\pi x}} \sin x$ (2) $\sqrt{\frac{2}{\pi x}} \cos x$	
	(3) $\sqrt{\frac{\pi x}{2}} \sin x$ (4) None of these	
32.	If P _n (x) is Legendre polynomial, then which of the following is not	
	correct ? (1) $P_0(x) = 1$ (2) $P_1(x) = x$ (3) $P_n(-x) = (-1)^n P_n(x)$ (4) None of these	
33.	The value of $\int_{-1}^{+1} P_n^2(x) dx$ is equal to	
	(1) 0 (2) $\frac{2}{2n+1}$	
	(3) $\frac{2}{n+1}$ (4) 1	
34.	Inverse Laplace transform of $\left[\frac{s^2 - a^2}{(s^2 + a^2)^2}\right]$ is	
	(1) t sin at (2) t cosh at (3) t cos at (4) t sinh at	
35.	If F _s (s) and F _c (s) are Fourier sine and cosine transforms of respectively, then which is correct?	
	(1) $F_s[f(t)\cos at] = \frac{1}{2}[F_s(s+a) + F_s(s-a)]$	
	(2) $F_s[f(t)\cos at] = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$	
	(3) $F_s[f(t) \sin at] = \frac{1}{2} [F_s(s+a) + F_s(s-a)]$	
	(4) None of these	

Question No.	Questions				
36.	Which of the following symbols in C - Language represents logical operator?				
	(1) ==	(2)	&&		
	(3) %	(4)	>=		
37.	The purpose of strrev () funct	ion in	C – Language is to		
	(1) Compare two strings	(2)	Find length of a string		
Value of	(3) Reverse the string	(4)	Copy one string over the other.		
38.	Which of the following is an un	ncondi	tional control transfer statement?		
	(1) if statement	(2)			
27	(3) if-else statement	(4)	switch statement		
39.	Which of the following statem	ent is	incorrect?		
	(1) while (condition) {	(2)	do {		
	statement(s);		statement(s);		
	}		} while (condition);		
	(3) switch (expression)				
	{				
	case exp 1:				
	statement block-1				
	break;				
	case exp 2:				
	statement block-2				
	break;				
	default:				
	default block				
	}				
	statement t;				
	(4) None of these				

Question No.	Questions			
40.	To send the value of variable using pointers is known as			
	(1) Recursion (2) Call by reference			
	(3) Getw function (4) None of these			
41.	If $x = a (\theta - \sin \theta)$; $y = a (1 - \cos \theta)$, then the value of $\frac{dy}{dx}$ will be			
	(1) $\tan \frac{\theta}{2}$ (2) $\tan \theta$			
	(3) $\cot \frac{\theta}{2}$ (4) $\cot \theta$			
42.	Let $f(x) = \sqrt{x^2 - 4}$, $x \in [2, 4]$, then which of the following is true for $f(x)$?			
	(1) Roll's Theorem is applicable			
	(2) Lagrange's Mean Value Theorem is applicable			
	(3) There exists at least one $C = 2\sqrt{3}$ in (2, 4)			
	(4) All the above are true.			
43.	$\lim_{a \to b} \frac{a^b - b^a}{a^a - b^b} \text{ is}$			
	(1) $\frac{1 - \log b}{1 + \log b}$ (2) $\frac{1 - \log b}{1 + \log a}$			
	(3) $\log \frac{a}{b}$ (4) None of these			

Question No.	Questions				
44.	If $u = \log \left(\frac{x^2 + y^2}{x + y} \right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is equal to				
	(1)	0	(2)	u continue and an	
	(3)	1 + 10 = 10 = 10 = 10	(4)	e ^u	
45.	Which is not correct? (where symbols have their usual modifferential geometry).				
	(1)	$\frac{d\vec{t}}{ds} = k\vec{n}$	(2)	$\frac{d\vec{b}}{ds} = -\tau \vec{n}$	
	(3)	$\frac{d\vec{n}}{ds} = \tau \vec{b} - k \vec{t}$	(4)	$\vec{r}' \cdot \vec{r}''' = k^2$	
46.	The particular integral of $(D^2 - 2DD')$ z = sin $(x + 2y)$ is				
		$\frac{1}{6}\sin\left(x+2y\right)$	(2)	$\frac{1}{3}\sin\left(x+2y\right)$	
	(3)	$\frac{1}{6}\cos\left(x+2y\right)$	(4)	None of these	
47.	The partial differential equation				
		$\frac{\partial^2 z}{\partial x^2} - 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2}$	$\dot{c} = 0$ is		
	(1)	Parabolic	(2)	Hyperbolic	
	(3)	Elliptic	(4)	None of these	

Question No.	Questions				
48.	The characteristic equations of $\partial^2 u = \partial^2 u = \partial^2 u$				
	$\frac{\partial^2 \mathbf{u}}{\partial \mathbf{x}^2} - 2 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{x} \partial \mathbf{y}} - 8 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{y}^2} = 0$				
	are given by				
	(1) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} - 4 = 0$ (2) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} + 4 = 0$				
	(3) $dy + 2 dx = 0$ and $dy - 4 dx = 0$ (4) None of these				
49.	The equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$ is called				
	(1) One dimensional heat equation				
	(2) Two dimensional heat equation				
	(3) Two dimensional wave equation				
	(4) Laplace equation				
50.	Solution of $yp - xq = y^2 - x^2$ is				
	(1) $\phi(x^2 + y^2, xy - z) = 0$ (2) $\phi(xy, x^2 + y^2 + z^2) = 0$				
	(3) $\phi\left(\frac{1}{x} - \frac{1}{y}, \frac{x - y}{z}\right) = 0$ (4) None of these				
51.	Solution of differential equation $(y - px)^2 = 1 + p^2$, is				
	(1) $y = cx^2 + \sqrt{1-p^2}$ (2) $y = px + \sqrt{1+p^2}$				
	(3) $y = px - tan^{-1}c$ (4) $y = cx + \sqrt{1+c^2}$, is constant				

Question No.	Questions				
52.	P dx + x sin y dy = 0 is exact, then $P can be$.				
	$(1) \sin y + \cos y \qquad (2) -\sin y$				
	(3) $x^2 - \cos y$ (4) $\cos y$				
53.	The general solution of the differential equation $(D^2 + 6D + 9) y = 5 e^{2x}$ is				
	(1) $y = (c_1 + c_2 x) e^{3x} + 5 e^{2x}$ (2) $y = (c_1 + c_2 x) e^{-3x} + \frac{1}{5} e^{2x}$				
	(3) $y = (c_1 + c_2 x) e^{-3x} + e^{2x}$ (4) $y = (c_1 + c_2 x) e^{3x} + \frac{e^{2x}}{3}$				
54.	The solution of the differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ is				
	(1) $y = (c_1 + c_2 \log x) x^2$ (2) $y = (c_1 + c_2 x) e^{2x}$				
	(3) $y = c_1 x^2 + \frac{c_2}{x}$ (4) $y = (c_1 + c_2 x) e^{-x}$				
55.	The orthogonal trajectory of family of curves y = ax ² is				
	(1) $x^2 + y^2 = a^2$ (2) $x^2 + 2y^2 = a^2$				
	(3) $2x^2 + y^2 = a^2$ (4) $\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$				
56.	If the vectors $2\hat{\mathbf{i}} - \hat{\mathbf{j}} + \hat{\mathbf{k}}$; $\hat{\mathbf{i}} + 2\hat{\mathbf{j}} - 3\hat{\mathbf{k}}$ and $3\hat{\mathbf{i}} + a\hat{\mathbf{j}} + 5\hat{\mathbf{k}}$ be coplanar then the value of a is given by				
	(1) 1 (2) -2				
	(3) -3 $(4) -4$				

Question No.	Questions					
57.	The value of λ so that the vector $\vec{F} = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (x + \lambda z)\hat{k}$ is a solenoidal vector, is given by					
	(1) 2	(2) 3				
	(3) -2	(4) 1				
58.	Which is not correct? are unit vectors in the	(Here r, θ , z are cylindrical coordinates and \hat{e}_r , \hat{e}_{θ} , \hat{e}_{θ} ese coordinates),				
	$(1) \frac{\mathrm{d}}{\mathrm{d}t} \hat{\mathbf{e}}_{r} = \dot{\boldsymbol{\theta}} \hat{\mathbf{e}}_{\boldsymbol{\theta}}$	(2) $\frac{\mathrm{d}}{\mathrm{d}t}\hat{\mathbf{e}}_{\theta} = -\dot{\theta}\hat{\mathbf{e}}_{r}$				
	(3) $\hat{e}_r = \cos\theta \hat{i} + \sin\theta \hat{j}$	(4) $\hat{\mathbf{e}}_{\theta} = \cos \theta \hat{\mathbf{i}} - \sin \theta \hat{\mathbf{j}}$				
59.		d if S is closed surface enclosing a volume V, when awn unit-normal vector to the surface S, the				
	(1) 4V	(2) 3V				
	(3) 2V	(4) V				
60. Stoke's theorem is a relation between		elation between				
	(1) Line integral and Surface integral					
	(2) Line integral and Volume integral					
	(=)	(3) Surface integral and Volume integral				
		and Volume integral				

Question No.	Questions				
61.	The resultant of two forces P and Q act at right angles to P, the angle between the forces is				
	(1) cos ⁻¹	$\left(-\frac{P}{Q}\right)$	(2)	$\tan^{-1}\left(-\frac{P}{Q}\right)$	
	(3) sin ⁻¹	$\left(-\frac{Q}{P}\right)$	(4)	$\cos^{-1}\left(\frac{P}{Q}\right)$	
62.	Three forces 2P, 3P and 4P act at a point in direction parallel to the sides of an equilateral triangle taken in order. Magnitude of the resultant is				
	(1) 3P		(2)	2P 1 1 14 14 14 14 14 14 14 14 14 14 14 14	
	(3) $\sqrt{17}$ I	?	(4)	$\sqrt{3}$ P	
63.	If the normal reaction is 10 units and limiting friction is 5 units, then the coefficient of friction is				
	(1) 2		(2)	2/3	
	(3) $\frac{1}{2}$		(4)	None of these	
64.	Suppose a system of forces is reduced to a single force \vec{R} and a Couple of				
	moment \vec{k} whose axis coincides with the direction of acting force, then \vec{R}				
	and k taken together are called				
	(1) Null l	ine	(2)	Wrench	
	(3) Pitch		(4)	None of these	

Question No.	Questions				
65.	The condition that the straight line $\frac{x-f}{\ell} = \frac{y-g}{m} = \frac{z-h}{n}$ may be a null line				
	for the system of forces (X, Y, Z; L, M, N) is				
	X Y Z				
	$(1) \ell m n = L\ell + Mm + Nn$				
	(1) $\begin{vmatrix} X & Y & Z \\ \ell & m & n \\ f & g & h \end{vmatrix} = L\ell + Mm + Nn$				
	x y z				
	(2) ℓ m n = -(L ℓ + Mm + Nn)				
	(2) $\begin{vmatrix} x & y & z \\ \ell & m & n \\ X & Y & Z \end{vmatrix} = -(L\ell + Mm + Nn)$				
	(3) $Lx + My + Nz = 0$				
in digas	(4) None of these				
66.	The greatest lower bound of $\left\{ \left(1 + \frac{1}{n}\right)^n \right\}$ is				
	(1) 0 (2) 2				
	(3) 1 (4) None of these				
67.	The sequence $\left\{\frac{2n-7}{3n+2}\right\}$ is				
	(1) Monotonic increasing, and is bounded.				
	(2) Monotonic decreasing, and is bounded.				
	(3) Monotonic increasing and is not bounded.				
	(4) Monotonic decreasing and is not bounded.				

Question No.	Questions				
68.	The series whose n^{th} term is $(\sqrt{n^3+1}-\sqrt{n^3})$ is				
	(1) Divergent (2) Convergent				
	(3) Oscillatory (4) None of these				
69.	If $\sum u_n$ is a series of positive terms and if $\lim_{n\to\infty} (u_n)^{1/n} = \ell$, then the serie is divergent if				
	$(1) \ell > 1 \qquad (2) \ell < 1$				
	(3) $\ell \le 1$ (4) None of these				
70.	"A series obtained from an absolutely convergent series by a rearrangement of terms converges absolutely and has the same sum as the original series' is statement of a theorem known as (1) Riemann's rearrangement theorem (2) Dirichlet's theorem (3) Pringsheim's theorem (4) Cauchy's theorem				
71.	 If a function f be bounded on [a, b], then (1) f is necessarily R-integrable (2) f is R-integrable if [a, b] ⊂ N (3) f is not necessarily R-integrable (4) f is R-integrable if [a, b] = N ∪ φ 				
71.	 (1) f is necessarily R-integrable (2) f is R-integrable if [a, b] ⊂ N (3) f is not necessarily R-integrable 				
	 (1) f is necessarily R-integrable (2) f is R-integrable if [a, b] ⊂ N (3) f is not necessarily R-integrable (4) f is R-integrable if [a, b] = N ∪ φ 				

Question No.	Questions				
73.	If f is integrable on [a, b] and F is the primitive of f on [a, b], then $\int_{a}^{b} f dx = F(b) - F(a) \text{ is statement of}$				
	(1) First Mean Value theorem				
	(2) Fundamental theorem of integral calculus				
-, 1	(3) Baire's Category theorem				
TIT SA	(4) None of these				
74.	The integral $\int_{0}^{\pi/2} \frac{\sin x}{x^{n}} dx$ converges if				
	(1) $n < 1$ (2) $n > 1$				
	(3) $n > 2$ (4) $n < 2$				
75.	If on a non-empty set X , $d: X \times X \to R$ be a function such that				
	$d(x, y) = \begin{cases} 0 & \text{if } x = y \\ 1 & \text{if } x \neq y \end{cases}, \text{ then}$				
	(1) (X, d) is a semi-metric space (2) (X, d) is a metric-space				
	(3) (X, d) is not a metric-space (4) None of these				
76.	The derived set for the set $S = \left\{\frac{1}{n}; n \in N\right\}$ is				
	(1) R (2) N				
	(3) {0} (4) {0, ∞}				

Question No.	Questions					
77.	The statement "Every complete metric space is of the second category as a subset of itself" refers to					
	(1) Baire's Category Theorem					
	(2) Cantor's intersection Theorem					
	(3) Bolzano-Weierstrass property					
	(4) None of these					
78.	The set $G = \{1, w, w^2\}$, where w is a cube root of unity, with respect to multiplication is a					
	(1) Group (2) Abelian group					
	(3) Cyclic group (4) All of these					
79.	If H and K are two non-empty subsets of abelian group G, then HK is a subgroup of G if					
	(1) H is a subgroup of G					
	(2) K is a subgroup of G					
	(3) H ∩ K is subgroup of G					
	(4) H as well as K are subgroups of G.					
80.	If p is a prime, then any group G of order 2p has					
	(1) a normal subgroup of order p					
	(2) a normal subgroup of order 2p					
	(3) a normal subgroup of order p ²					
	(4) None of these					

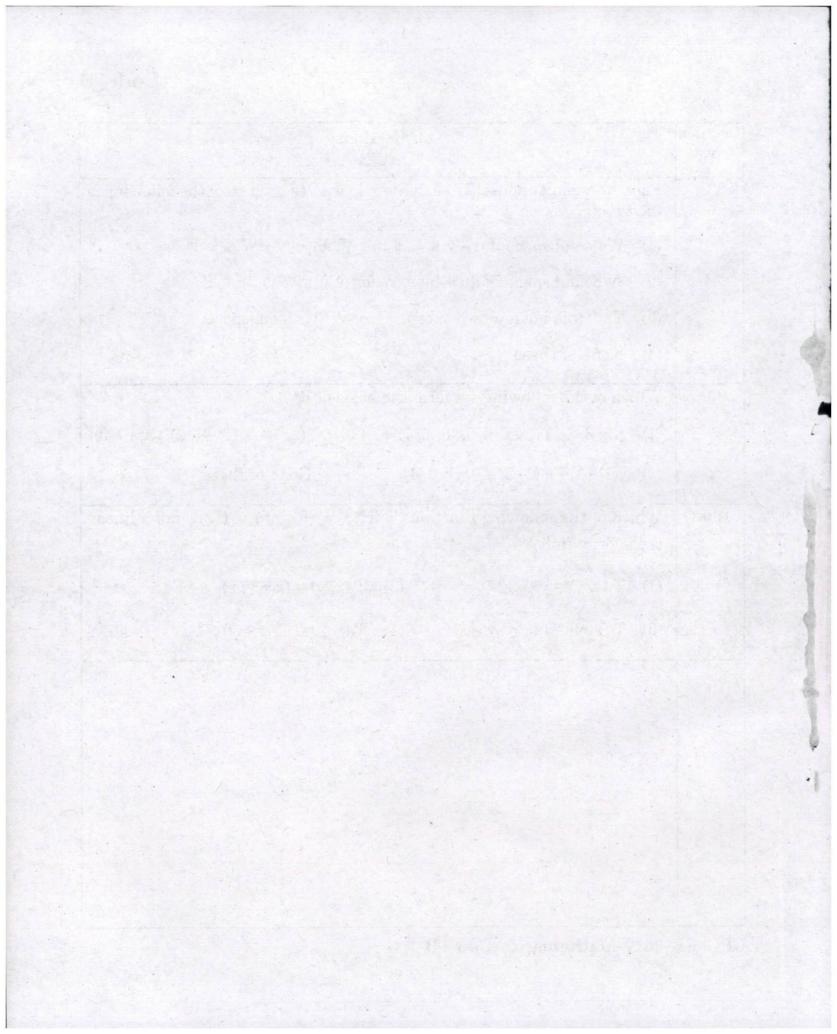
Question No.	Questions		
81.	If matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix}$, then A^2 is equal to $\begin{bmatrix} -1 & -2 & -3 \end{bmatrix}$		
	$\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ $(2) \begin{bmatrix} -1 & -2 & -3 \\ 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$ $(3) \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ $(4) \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$		
82.	If $A = \begin{bmatrix} 0 & 4 & -2 \\ x & 0 & -y \\ 2 & -8 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then $x - y = \dots$ is		
	(1) 8 (2) 4 (3) -12 (4) -8		
83.	 If 3x + 2y + z = 0; x + 4y + z = 0; 2x + y + 4z = 0, be a system of equations, then (1) It is inconsistent (2) It can be reduced to a single equation and so a solution does not exist. (3) It has only the trivial solution x = 0, y = 0, z = 0 (4) The determinant of the matrix of coefficient is zero. 		

Question No.	Questions The condition that the cubic equation $x^3-px^2+qx-r=0$ has all of its three roots equal is given by				
84.					
	(1) $p^2 = 3qr$ (2) $q^2 = 3pr$				
	(3) $r^2 = 3pq$ (4) None of these				
85.	Which of the following is not correct?				
	(1) Every square matrix satisfies its own characteristic equation.				
	(2) If λ is an eigen-value of a matrix A, then $\frac{1}{\lambda}$ is the eigen-value of the matrix A^{-1} .				
	(3) The sum of the eigen-values of a matrix is equal to the sum of elements of principal diagonal.				
	(4) The matrices A and A ^T have different eigen-values.				
86.	Which of the following function f (x) is differentiable at the origin:				
	(1) $f(x) = x $ (2) $f(x) = x^{2/3}$				
	(3) $f(x) = \begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ (4) $f(x) = e^{-\frac{1}{x^2}}$				
87.	The curve $2x^2 - 3xy - 2y^2 = 1$ has two asymptotes that are				
<i>i</i>	(1) Perpendicular (2) Parallel				
	(3) Intersect at an angle 60° (4) None of these				

Question No.	Questions				
88.	The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is				
	(1) 2	(2) $\frac{\sqrt{2}}{2}$ (4) $\sqrt{2}$			
	(3) 2√2	$(4) \sqrt{2}$			
89.	9. For the curve $y^2 (1 + x) = x^2 (1 - x)$, the origin is a				
	(1) Cusp	(2) Point of inflex	cion		
	(3) Node	(4) None of these	negration in the Se		
90.	The area of surface of the solid generated by the revolution of the line segment $y = 2x$ from $x = 0$ to $x = 2$, about x-axis is equal to				
	(1) $\pi \sqrt{5}$	$(2) 2\pi \sqrt{5}$			
	(1) $\pi \sqrt{5}$ (3) $4\pi \sqrt{5}$	(4) $8\pi\sqrt{5}$			
91.	If $u = x + y$, and $v = (x - y)$	+ y) ² , then value of $\frac{\partial (u, v)}{\partial (x, y)}$ is	shared in the		
	(1) 0	(2) $4(x+y)^2$			
	(3) x	$(4) \frac{1}{x}$			
92.	The value of Beta fun	tion $\beta\left(\frac{1}{2},\frac{1}{2}\right)$ is			
	(1) $\sqrt{2\pi}$	(2) $\pi \sqrt{2}$			
	(3) $\sqrt{\pi}$	(4) π			

Question No.	Questions			
93.	The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is given by			
	(1) π ab (2) 2π ab			
	(3) $\pi a^2 b$ (4) πab^2			
94.	The Fourier series for the function $f(x) = x , -\pi \le x \le \pi$ contains			
	(1) only sine terms (2) only cosine terms			
	(3) both sine and cosine terms (4) None of these			
95.	The Harmonic conjugate of $u(x, y) = \frac{y}{x^2 + y^2}$ is			
	(1) $\frac{x}{x^2 + y^2}$ (2) $\frac{-x}{x^2 + y^2}$			
	(1) $\frac{x}{x^2 + y^2}$ (2) $\frac{-x}{x^2 + y^2}$ (3) $\frac{1}{x^2 + y^2}$			
96.	The fixed points of the mapping $w = \frac{(5Z+4)}{(Z+5)}$ are			
	(1) 2, 2 (2) -2, -2			
	(3) 2, -2 (4) None of these			
97.	The bilinear transformation that maps the points $z = \infty$, i, 0 into the points $w = 0$, i and ∞ is given by			
	(1) $w = z$ (2) $w = -z$			
	(3) $w = \frac{1}{z}$ (4) $w = -\frac{1}{z}$			

Question No.	Questions	
98.	For a non-empty subset W of a vector space V(F), which of the following is incorrect ?	
	(1) W be subspace if $u - v \in W$, a $u \in W$ for $u, v \in W$, $a \in F$	
	(2) W be subspace iff $au + bv \in W$ for $u, v \in W$; $a, b \in F$	
	(3) The union of any two subspaces of V(F) is a subspace	
	(4) None of these	
99.	Which of the following set form the basis of R ³ :	
	$(1) \{(2, 3, 1), (7, -6, 17), (5, 2, 7)\} \qquad (2) \qquad \{(2, 1, 4), (1, -1, 2), (3, 1, -2)\}$	
	(3) $\{(1, -1, 3), (1, 2, -3), (1, 0, 1)\}$ (4) None of these	
100.	Which of the following functions T from $V_2(R)$ into $V_2(R)$ is not a linear transformation?	
	(1) $T(x, y) = (y, x)$ (2) $T(x, y) = (x + y, x)$	
	(3) $T(x, y) = (x - y, y - x)$ (4) $T(x, y) = (1 + x, y)$	



(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

(CPG-EE-2017)

	Subject : MATHEM	ATICS
		Sr. No. 10119
Code C		SET-"A"
Time: 1½ Hours	Total Questions:	100 Max. Marks: 100
Roll No.	(in figure)	(in words)
Name :	Date of I	Birth:
Father's Name :		's Name :
Date of Examination:		
(Signature of the candid	date)	(Signature of the Invigilator)
CANDIDATES MII	ST READ THE FO	LLOWING INFORMATION/
INSTRUCTIONS BEF	FORE STARTING THE	QUESTION PAPER.
1. All questions are con	mpulsory and carry equal i	marks. The candidates are required
to attempt all ques	must return the Ques	tion book-let as well as OMR
anarron about to the	Invigilator concerned be	fore leaving the Examination nail,
foiling which a cas	se of use of unfair-means	/ misbehaviour will be registered
against him / her,	in addition to lodging of a	in FIR with the police. Further the
answer-sheet of su	ch a candidate will not be	tion(s) in the Question Booklet, the
3. In case there is any	that to the notice of the Con	ntroller of Examinations in writing
within two hours	after the test is over. No s	uch complaint(s) will be entertained
thereafter.		
4. The candidate M	UST NOT do any roug	gh work or writing in the OMR
Answer-Sheet. Roy	of work, if any, may be of OT be ticked in the Quest	done in the question book-let itself.
Answers MUSI N	or Blue BALL POINT P	EN of good quality in the OMR
Answer-Sheet.		
6 There will be Ne	gative marking. Each	correct answer will be awarded
one full mark an	d each incorrect answe	er will be negatively marked for
which the candi	date will get ¼ discredi	it. Cutting, erasing, overwriting nswer-Sheet will be treated as
incorrect answer	r.	
7 PEFORE ANSWE	ERING THE QUESTION	IS, THE CANDIDATES SHOULD
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BOOK-LET. COM	PLAINTS, IF ANY, REGA	RDING MISPRINTING ETC. WILL S AFTER STARTING OF THE
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ELECTION 1

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Question No.	Questions The resultant of two forces P and Q act at right angles to P, the angle between the forces is		
1.			
	$(1) \cos^{-1}\left(-\frac{P}{Q}\right)$	(2)	$\tan^{-1}\left(-\frac{P}{Q}\right)$
	(3) $\sin^{-1}\left(-\frac{Q}{P}\right)$	(4)	$\cos^{-1}\left(\frac{P}{Q}\right)$
2.			a point in direction parallel to the in order. Magnitude of the resultant
	(1) 3P	(2)	2P
	(3) √17 P	(4)	√3 P
3.	If the normal reaction is		l limiting friction is 5 units, then th
	(1) 2	(2)	2/3
	(3) $\frac{1}{2}$	(4)	None of these
4.	Suppose a system of fo	rces is reduce	d to a single force \vec{R} and a Couple
,	moment \vec{k} whose axis and \vec{k} taken together a		the direction of acting force, then
	(1) Null line	(2)	Wrench
	(3) Pitch	(4)	None of these

Question No.	Questions	
5.	The condition that the straight line $\frac{x-f}{\ell} = \frac{y-g}{m} = \frac{z-h}{n}$ may be a null line for the system of forces (X, Y, Z; L, M, N) is	
	(1) $\begin{vmatrix} X & Y & Z \\ \ell & m & n \\ f & g & h \end{vmatrix} = L\ell + Mm + Nn$	
	(2) $\begin{vmatrix} x & y & z \\ \ell & m & n \\ X & Y & Z \end{vmatrix} = - (L\ell + Mm + Nn)$ (3) $Lx + My + Nz = 0$ (4) None of these	
6.	The greatest lower bound of $\left\{ \left(1 + \frac{1}{n}\right)^n \right\}$ is	
	(1) 0 (2) 2	
	(3) 1 (4) None of these	
7.	The sequence $\left\{\frac{2n-7}{3n+2}\right\}$ is	
	(1) Monotonic increasing, and is bounded.	
	(2) Monotonic decreasing, and is bounded.	
	(3) Monotonic increasing and is not bounded.	
	(4) Monotonic decreasing and is not bounded.	

Question No.	Questions		
8.	The series whose n th term is $(\sqrt{n^3+1}-\sqrt{n^3})$ is		
A to a great	(1) Divergent (2) Convergent		
	(3) Oscillatory (4) None of these		
9.	If $\sum u_n$ is a series of positive terms and if $\lim_{n\to\infty} (u_n)^{1/n} = \ell$, then the series		
	is divergent if		
	$(1) \ell > 1 \qquad (2) \ell < 1$		
	(3) $\ell \le 1$ (4) None of these		
10.	"A series obtained from an absolutely convergent series by a rearrangement of terms converges absolutely and has the same sum as the original series", is statement of a theorem known as		
	(1) Riemann's rearrangement theorem (2) Dirichlet's theorem		
	(3) Pringsheim's theorem (4) Cauchy's theorem		
11.	Solution of differential equation $(y - px)^2 = 1 + p^2$, is		
- 3	(1) $y = cx^2 + \sqrt{1-p^2}$ (2) $y = px + \sqrt{1+p^2}$		
	(3) $y = px - tan^{-1} c$ (4) $y = cx + \sqrt{1 + c^2}$, is constant		
12.	P dx + x sin y dy = 0 is exact, then $P can be$		
	$(1) \sin y + \cos y \qquad (2) - \sin y$		
	(3) $x^2 - \cos y$ (4) $\cos y$		
13.	The general solution of the differential equation $(D^2 + 6D + 9) y = 5 e^{2x}$ is		
	(1) $y = (c_1 + c_2 x) e^{3x} + 5 e^{2x}$ (2) $y = (c_1 + c_2 x) e^{-3x} + \frac{1}{5} e^{2x}$		
	(3) $y = (c_1 + c_2 x) e^{-3x} + e^{2x}$ (4) $y = (c_1 + c_2 x) e^{3x} + \frac{e^{2x}}{3}$		

Question No.	Questions
14.	The solution of the differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ is
	(1) $y = (c_1 + c_2 \log x) x^2$ (2) $y = (c_1 + c_2 x) e^{2x}$
	(3) $y = c_1 x^2 + \frac{c_2}{x}$ (4) $y = (c_1 + c_2 x) e^{-x}$
15.	The orthogonal trajectory of family of curves $y = ax^2$ is
	(1) $x^2 + y^2 = a^2$ (2) $x^2 + 2y^2 = a^2$
2.30	(3) $2x^2 + y^2 = a^2$ (4) $\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$
16.	If the vectors $2\hat{i} - \hat{j} + \hat{k}$; $\hat{i} + 2\hat{j} - 3\hat{k}$ and $3\hat{i} + a\hat{j} + 5\hat{k}$ be coplanar then the value of a is given by
	(1) 1 (2) -2
	(3) -3 $(4) -4$
17.	The value of λ so that the vector $\vec{F} = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (x + \lambda z)\hat{k}$ is a solenoidal vector, is given by
	(1) 2
	(3) -2 $(4) 1$
18.	Which is not correct? (Here r, θ , z are cylindrical coordinates and \hat{e}_r , \hat{e}_{θ} , \hat{e}_z are unit vectors in these coordinates),
	(1) $\frac{d}{dt} \hat{\mathbf{e}}_{r} = \dot{\theta} \hat{\mathbf{e}}_{\theta}$ (2) $\frac{d}{dt} \hat{\mathbf{e}}_{\theta} = -\dot{\theta} \hat{\mathbf{e}}_{r}$
	(3) $\hat{\mathbf{e}}_{r} = \cos\theta \hat{\mathbf{i}} + \sin\theta \hat{\mathbf{j}}$ (4) $\hat{\mathbf{e}}_{\theta} = \cos\theta \hat{\mathbf{i}} - \sin\theta \hat{\mathbf{j}}$

Question No.	Questions		
19.	If $\vec{R} = x \hat{i} + y \hat{j} + z \hat{k}$, and if S is closed surface enclosing a volume V, where \hat{n} is the outward drawn unit-normal vector to the surface S, then		
	$\iint_{S} \vec{R} \cdot \hat{n} dS \text{ is equal to}$		
	(1) 4V (2) 3V		
	(3) 2V (4) V		
20.	Stoke's theorem is a relation between		
1.06	(1) Line integral and Surface integral		
	(2) Line integral and Volume integral		
	(3) Surface integral and Volume integral		
	(4) None of these		
21.	If matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \\ -1 & -2 & -3 \end{bmatrix}$, then A^2 is equal to		
	(1) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} -1 & -2 & -3 \\ 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$		
	(3) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (4) $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$		

Question No.	Questions	
22.	If $A = \begin{bmatrix} 0 & 4 & -2 \\ x & 0 & -y \\ 2 & -8 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then $x - y = \dots$ is	
	(1) 8 (2) 4	
	(3) -12 $(4) -8$	
23.	If $3x + 2y + z = 0$; $x + 4y + z = 0$; $2x + y + 4z = 0$, be a system of equations, then	
100	(1) It is inconsistent	
	(2) It can be reduced to a single equation and so a solution does not exist.	
	(3) It has only the trivial solution $x = 0$, $y = 0$, $z = 0$	
	(4) The determinant of the matrix of coefficient is zero.	
24.	The condition that the cubic equation $x^3 - px^2 + qx - r = 0$ has all of its three roots equal is given by	
Liu di	(1) $p^2 = 3qr$ (2) $q^2 = 3pr$	
	(3) $r^2 = 3pq$ (4) None of these	
25.	Which of the following is not correct?	
	(1) Every square matrix satisfies its own characteristic equation.	
	(2) If λ is an eigen-value of a matrix A, then $\frac{1}{\lambda}$ is the eigen-value of the matrix A^{-1} .	
	(3) The sum of the eigen-values of a matrix is equal to the sum of elements of principal diagonal.	
	(4) The matrices A and A ^T have different eigen-values.	

Question No.	Questions			
26.	Which of the following function f (x) is differentiable at the origin:			
	(1) f(x) = x	(2) $f(x) = x^{\frac{2}{3}}$		
	(3) $f(x) = \begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$	(4) $f(x) = e^{-1/x^2}$		
27.	The curve $2x^2 - 3xy - 2y^2 = 1$ ha	s two asymptotes that are		
	(1) Perpendicular	(2) Parallel		
	(3) Intersect at an angle 60°	(4) None of these		
28.	The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is			
	(1) 2	(2) $\frac{\sqrt{2}}{2}$ (4) $\sqrt{2}$		
	(3) $2\sqrt{2}$	$(4) \sqrt{2}$		
29.	For the curve $y^2 (1 + x) = x^2 (1 - x)$, the origin is a			
	(1) Cusp	(2) Point of inflexion		
	(3) Node	(4) None of these		
30.	The area of surface of the solic segment $y = 2x$ from $x = 0$ to $x = 0$	d generated by the revolution of the line 2, about x-axis is equal to		
	(1) $\pi \sqrt{5}$	(2) $2\pi \sqrt{5}$		
	(3) $4\pi \sqrt{5}$	(4) $8\pi \sqrt{5}$		

Question No.	Questions	
31.	With respect to standard basis vectors, a linear transformation	
	T: I R ⁴ \rightarrow IR ³ is given by the matrix $\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$	
	The dimension of Ker (T) is	
	(1) 1 (2) 2	
	(3) 3 (4) 4	
32.	The norm of x with respect to inner product space < x, x > is given by	
	(1) $ x = \langle x, x \rangle$ (2) $ x = \langle x, x \rangle^2$	
	(3) $ x ^2 = \langle x, x \rangle$ (4) None of these	
33.	Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statements implies that T is bijective?	
	(1) $\operatorname{Rank}(T) - \operatorname{Nullity}(T) = n$ (2) $\operatorname{Rank}(T) + \operatorname{Nullity}(T) = n$	
	(3) Rank (T) = Nullity (T) = n (4) None of these	
34.	Let V be an inner product space, then $ < u, v> \le u . v $ for all $u, v \in V$, is known as	
	(1) Bessel's Inequality (2) Cauchy Schwarz inequality	
	(3) Triangle inequality (4) None of these	
35.	Given that $\begin{array}{ c c c c c c c c c c c c c c c c c c c$	
	(1) 3 (2) 9	
	(3) 5 (4) 2	

Question No.		Questions
36.	The order of convergence of	Regula-Falsi method is
	(1) 2	(2) 1.5
	(3) 1.618	(4) 2.98
37.	f (x) is given by $\begin{array}{ c c c c c c c c c c c c c c c c c c c$	0.5 1 1.5 2.0 Then using Trapezoidal 0.8 0.5 0.3 0.1
,	rule, the value of $\int_{0}^{2} f(x) dx$ is	s
	(1) 1.075	(2) 1.575
	(3) 0.775	(4) 2.150
38.	Consider the initial value problem $\frac{dy}{dx} = -x y$; y (0) = 1. series solution upto x^4 is	
	(1) $y = 1 + \frac{x^2}{2} + \frac{x^4}{8}$	(2) $y = x + \frac{x^2}{2} + \frac{x^4}{6}$
	(3) $y = 1 + \frac{x^3}{6} + \frac{x^4}{8}$	(4) None of these
39.	The Mean and Variance are	same for a distribution namely:
00.		
00.	(1) Binomial distribution	
	(1) Binomial distribution(2) Poisson's distribution	

Question No.	Questions						
40.	If X follows binomial distribution with mean 3 and variance $\frac{3}{2}$, the value of P (X \leq 5) is						
	(1) $\frac{1}{64}$ (2) $\frac{1}{8}$						
	(3) $\frac{63}{64}$ (4) None of these						
41.	If a function f be bounded on [a, b], then						
	(1) f is necessarily R-integrable						
	(2) f is R-integrable if $[a, b] \subset N$						
	(3) f is not necessarily R-integrable						
	(4) f is R-integrable if [a, b] = $N \cup \phi$						
42.	If f be a monotonic function, then						
	(1) f be R-integrable (2) f be R-integrable if $f \neq 0$						
	(3) f be bounded (4) All the above						
43.	If f is integrable on [a, b] and F is the primitive of f on [a, b], then						
	$\int_{a}^{b} f dx = F(b) - F(a) \text{ is statement of}$						
	(1) First Mean Value theorem						
	(2) Fundamental theorem of integral calculus						
	(3) Baire's Category theorem						
	(4) None of these						

Question No.	Questions						
44.	The integral $\int_{0}^{\frac{\pi}{2}} \frac{\sin x}{x^{n}} dx$ converges if						
	(1)	n < 1	(2)	n > 1			
	(3)	n > 2	(4)	n < 2			
45.	If o	n a non-empty s	set X, d: $X \times X \rightarrow$	R be a	a function such that		
		$d(x, y) = \begin{cases} 0 & \text{if} \\ 1 & \text{if} \end{cases}$	x = y $x \neq y$, then				
	(1)	(X, d) is a sem	i-metric space	(2)	(X, d) is a metric-space		
	(3)	(X, d) is not a	metric-space	(4)	None of these		
46.	The derived set for the set $S = \left\{ \frac{1}{n}; n \in \mathbb{N} \right\}$ is						
	(1)	R	(2)	N			
	(3)	{0}	(4)	$\{0, \infty\}$	1		
47.	The statement "Every complete metric space is of the second category as a subset of itself" refers to						
	(1) Baire's Category Theorem						
	(2) Cantor's intersection Theorem						
	(3) Bolzano-Weierstrass property						
	(4) None of these						
48.	The set $G = \{1, w, w^2\}$, where w is a cube root of unity, with respect to multiplication is a						
	(1)	Group	(2)	Abeli	ian group		
	(3)	Cyclic group	(4)	All of	fthese		

Question No.	Questions If H and K are two non-empty subsets of abelian group G, then HK is a subgroup of G if						
49.							
	(1)	H is a subgrou	ıp of G				
	(2)	K is a subgrou	p of G				
	(3)	$H \cap K$ is subgr	roup of G				
	(4)	H as well as K	are subgroups of	f G.			
50.	Ifp	is a prime, the	n any group G of	order 2p has			
	(1) a normal subgroup of order p						
	(2) a normal subgroup of order 2p						
	(3) a normal subgroup of order p ²						
	(4)	None of these					
51.	If $x = a (\theta - \sin \theta)$; $y = a (1 - \cos \theta)$, then the value of $\frac{dy}{dx}$ will be						
	(1)	$\tan \frac{\theta}{2}$	(2)	tan θ			
W	(3)	$\cot \frac{\theta}{2}$	(4)	cot θ			
52.	Let $f(x) = \sqrt{x^2 - 4}$, $x \in [2, 4]$, then which of the following is true for $f(x)$?						
	(1) Roll's Theorem is applicable						
	(2) Lagrange's Mean Value Theorem is applicable						
	(3) There exists at least one $C = 2\sqrt{3}$ in $(2, 4)$						
	(4)	All the above a	are true.				

Question No.	Questions						
53.	$\lim_{a \to b} \frac{a^b - b^a}{a^a - b^b} \text{ is}$						
	(1) $\frac{1 - \log b}{1 + \log b}$ (2) $\frac{1 - \log b}{1 + \log a}$						
	(3) $\log \frac{a}{b}$ (4) None of these						
54.	If $u = \log \left(\frac{x^2 + y^2}{x + y} \right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is equal to						
	(1) 0 (2) u						
	(3) 1 (4) e ^u						
55.	Which is not correct? (where symbols have their usual meanings in differential geometry).						
	(1) $\frac{d\vec{t}}{ds} = k\vec{n}$ (2) $\frac{d\vec{b}}{ds} = -\tau \vec{n}$						
	(3) $\frac{d\vec{n}}{ds} = \tau \vec{b} - k \vec{t}$ (4) $\vec{r}' \cdot \vec{r}''' = k^2$						
56.	The particular integral of $(D^2 - 2DD')$ z = $\sin (x + 2y)$ is						
	(1) $\frac{1}{6} \sin(x + 2y)$ (2) $\frac{1}{3} \sin(x + 2y)$						
	(3) $\frac{1}{6}\cos(x+2y)$ (4) None of these						

The partial differential equation							
$\frac{\partial^2 z}{\partial x^2} - 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0 \text{is}$							
(1) Parabolic (2) Hyperbolic							
(3) Elliptic (4) None of these							
The characteristic equations of							
$\frac{\partial^2 \mathbf{u}}{\partial \mathbf{x}^2} - 2 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{x} \partial \mathbf{y}} - 8 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{y}^2} = 0$							
are given by							
(1) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} - 4 = 0$ (2) $\frac{dy}{dx} - 2 = 0$ and $\frac{dy}{dx} + 4 = 0$							
(3) $dy + 2 dx = 0$ and $dy - 4 dx = 0$ (4) None of these							
The equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$ is called							
(1) One dimensional heat equation							
(2) Two dimensional heat equation							
(3) Two dimensional wave equation							
(4) Laplace equation							
Solution of $yp - xq = y^2 - x^2$ is							
(1) $\phi(x^2 + y^2, xy - z) = 0$ (2) $\phi(xy, x^2 + y^2 + z^2) = 0$							
(3) $\phi\left(\frac{1}{x} - \frac{1}{y}, \frac{x - y}{z}\right) = 0$ (4) None of these							

Question No.	Questions						
61.	Cayley's theorem states that						
	(1) Every finite group is isomorphic to a permutation group						
	(2) Every f	finite group is	isomorphi	ic to a quotient group			
	(3) Every s	subgroup of a	cyclic grou	p is cyclic			
	(4) The order of each subgroup of a finite group is a divisor of the order of the group.						
62.	The ring of	even integers i	is also a				
	(1) Field		(2)	Integral domain			
	(3) Division	n ring	(4)	Commutative ring			
63.	A division ring has at least elements.						
	(1) 1		(2)	2			
	(3) 3		(4)	None of these			
64.	The number of trivial subgroups of a cyclic group of order 8 is						
	(1) 0		(2)	1			
	(3) 2		(4)	3			
65.	The transver	rse component	of acceler	ation is given by			
	$(1) \frac{1}{r} \frac{d}{dt} \left(r^2 - \frac{1}{r^2} \right)$		(2)	$\frac{d^2r}{dt^2} - r\left(\frac{d\theta}{dt}\right)^2$			
	$(3) \frac{d^2r}{dt^2} + r\left(-\frac{1}{2}\right)^2 + r\left(-$	$\left(\frac{d\theta}{dt}\right)^2$	(4)	$r\frac{d^2\theta}{dt^2} - 2\frac{dr}{dt}\frac{d\theta}{dt}$			

Question No.	Questions						
66.	A particle executing a S.H.M. has acceleration 8 cm/sec ² when it is at a distance 2 cm from the centre. The time period will be						
	(1) $\frac{2}{\pi}$ sec.	(2) $\frac{1}{\pi}$ s	ec.				
	(3) $\frac{\pi}{2}$ sec.	(4) π se	ec.				
67.	A man while going on a scooter with a speed of 10 m/sec, a child on the road and brings the scooter to stop, 4 seconds just in time to save the child. If the weight of the scooter together with the man is 200 kg, what retarding force was applied on the scooter?						
	(1) 300 N	(2) 400	N				
	(3) 500 N	(4) 600	N				
68.	If the greatest height attained by a projectile be equal to the horizontal range, then the angle of projection is given by						
	(1) $\tan^{-1}\left(\frac{1}{4}\right)$ (3) $\tan^{-1}2$	(2) tan	-1 4				
	(3) tan ⁻¹ 2	(4) tan	$-1\left(\frac{1}{2}\right)$				
69.	The differential equation of a central orbit under P as central force per						
	unit mass, in polar form	is given by : (He	ere $u = \frac{1}{r}$ and h is constant).				
	(1) $P = h^2 u^2 \left[u + \frac{d^2 u}{d\theta^2} \right]$	(2) P=	$h^2 u^2 \left[u + \left(\frac{du}{d\theta} \right)^2 \right]$				

Question No.	Questions						
70.	Which is not correct?						
		ve to the sun, the plan	nets	describe ellipses with the sun as one			
	focus.						
Fut		dius vector drawn fr nstant rate	om t	he sun to a planet sweeps out areas			
	(3) The square of the periodic times are proportional to the semi-major axis of the elliptic orbits and hence also to the mean distances from the sun.						
	forces,			action of a conservative system of d potential energies remain constant			
71.	If $u = x + y$,	and $v = (x + y)^2$, the	n va	lue of $\frac{\partial (u, v)}{\partial (x, y)}$ is			
	(1) 0		(2)	$4(x + y)^2$			
	(3) x		(4)	$\frac{1}{x}$			
72.	The value of Beta function $\beta\left(\frac{1}{2}, \frac{1}{2}\right)$ is						
	(1) $\sqrt{2\pi}$		(2)	$\pi \sqrt{2}$			
	(3) $\sqrt{\pi}$		(4)	π			
73.	The area of	the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} =$	= 1 is	s given by			
	(1) π ab		(2)	2π ab			
	(3) $\pi a^2 b$		(4)	π ab²			
74.	The Fourier series for the function $f(x) = x , -\pi \le x \le \pi$ contains						
	(1) only si	ne terms	(2)	only cosine terms			
	(3) both s	ne and cosine terms	(4)	None of these			

Question No.			Ques	tions				
75.	The Harmonic conjugate of $u(x, y) = \frac{y}{x^2 + y^2}$ is							
	(1)	$\frac{x}{x^2 + y^2}$	(2)	$\frac{-1}{x^2+}$	$\frac{x}{y^2}$			
	(3)	$\frac{1}{x^2 + y^2}$	(4)	$x^2 -$	y^2			
76.	The	fixed points of the n	napping w =	(5Z + (Z +	+4) 5) are			
	(1)	2, 2	(2)	-2, -	-2			
Dress.	(3)	2, -2	(4)	Non	e of these			
77.	The bilinear transformation that maps the points $z = \infty$, i, 0 into the points $w = 0$, i and ∞ is given by							
	(1)	w = z	(2)	w = -	- z			
	(3)	$w = \frac{1}{z}$	(4)	w = -	$-\frac{1}{z}$			
78.	For a non-empty subset W of a vector space V(F), which of the following is incorrect?							
	(1) W be subspace if $u - v \in W$, a $u \in W$ for $u, v \in W$, $a \in F$							
	(2) W be subspace iff $au + bv \in W$ for $u, v \in W$; $a, b \in F$							
	(3) The union of any two subspaces of V(F) is a subspace							
	(4)	None of these						
79.	Whi	ch of the following se	et form the l	pasis (of R ³ :			
	(1)	$\{(2, 3, 1), (7, -6, 17)\}$, (5, 2, 7)}	(2)	$\{(2, 1, 4), (1, -1, 2), (3, 1, -2)\}$			
	(3)	$\{(1, -1, 3), (1, 2, -3),$	$(1, 0, 1)$ }	(4)	None of these			

Question No.	Questions						
80.	Which of the following functions T from $V_2(R)$ into $V_2(R)$ is not a linear transformation?						
	(1) $T(x, y) = (y, x)$ (2) $T(x, y) = (x + y, x)$						
	(3) $T(x, y) = (x - y, y - x)$ (4) $T(x, y) = (1 + x, y)$						
81.	The centre of the sphere $x^2 + y^2 + z^2 - 4x + 6y - 8z + 4 = 0$ is						
	$(1) (2, -3, 4) \qquad \qquad (2) (-2, 3, -4)$						
	$(3) (-4, 6, -8) \qquad \qquad (4) (4, -6, 8)$						
82.	The equation of the right circular cone whose axis is $x = y = z$, vertex is the origin and the semi-vertical angle is 45° is given by						
	(1) $(x^2 + y^2 + z^2) = 3 (x + y + z)^2$ (2) $2 (x + y + z)^2 = 21 (x^2 + y^2 + z^2)$						
	(3) $3(x^2 + y^2 + z^2) = 2(x + y + z)^2$ (4) $x^2 + y^2 + z^2 = \frac{1}{2}$						
83.	The equation of the cylinder, whose generators are parallel to the line						
	$\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$ and whose guiding curve is the ellipse $x^2 + 2y^2 = 1$, $z = 0$ is given by						
	(1) $(3z - x)^2 + 2(2z + 3y)^2 = 9$ (2) $(3x - z)^2 + 2(3y + 2z)^2 = 9$						
	(3) $(3x + z)^2 + 2(3y - 2z)^2 = 9$ (4) None of these						
84.	The equation of the tangent to the parabola $y^2 + 4y + 20x = 0$ at $(0, 0)$ is						
	(1) $y = 2x$ (2) $y = 5x$						
195	(3) $x - 5y = 0$ (4) $y + 5x = 0$						

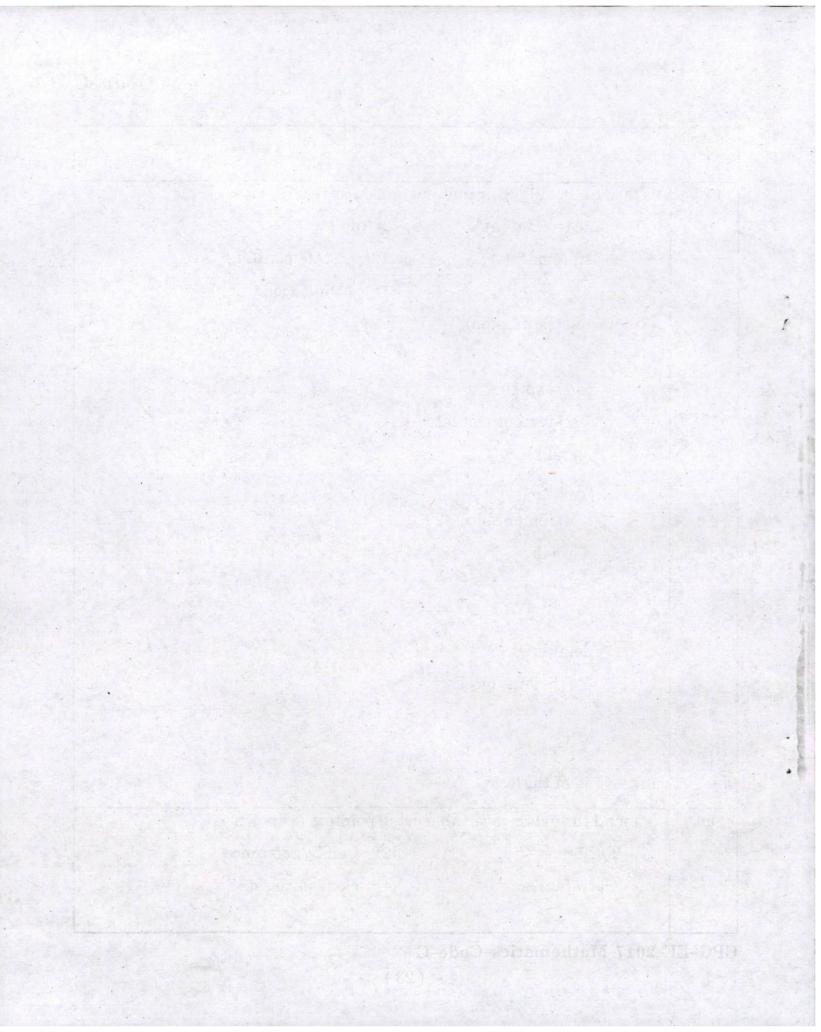
Question No.	Questions					
85.	The equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{2z}{c}$, represents					
	(1)	Hyperboloid of one sheet	(2)	Ellip	tic Paraboloid	
	(3)					
86.	(n ⁷	– n) is divisible by				
	(1)	1	(2)	7		
	(3)	30	(4)	42		
87.	Con	igruence $33x \equiv 22 \pmod{11}$ h	nas			
	(1)	3 solutions	(2)	11 so	lutions	
	(3)	6 solutions	(4)	9 sol	utions	
		 a^{p-1} ≡ 1 (mod p) nown as Fermat's Theorem Chinese Remainder Theorem 	em	(2) (4)	Wilson's Theorem None of these	
89.						
89.	The	value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is				
89.			(2)	0		
89.		value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is	(2)		9 + i sin 20	
90.	(1) (3)	value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is	(2)		9 + i sin 20	
	(1) (3) Whi	value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is $1 \cos 10 \theta + i \sin 10 \theta$	(2) (4)	cos 2	$\theta + i \sin 2\theta$ $\theta = \frac{2}{e^{\theta} - e^{-\theta}}$	

CPG-EE-2017-Mathematics-Code-C

Question No.	Questions				
91.	The value of Bessel's function $J_{\frac{1}{2}}$ (x) is given by				
	(1) $\sqrt{\frac{2}{\pi x}} \sin x$ (2) $\sqrt{\frac{2}{\pi x}} \cos x$				
	(3) $\sqrt{\frac{\pi x}{2}} \sin x$ (4) None of these				
92.	If P_n (x) is Legendre polynomial, then which of the following is not correct ?				
	(1) $P_0(x) = 1$ (2) $P_1(x) = x$				
	(3) $P_n(-x) = (-1)^n P_n(x)$ (4) None of these				
93.	The value of $\int_{-1}^{+1} P_n^2(x) dx$ is equal to				
	(1) 0 (2) $\frac{2}{2n+1}$				
	(3) $\frac{2}{n+1}$ (4) 1				
94.	Inverse Laplace transform of $\left[\frac{s^2-a^2}{(s^2+a^2)^2}\right]$ is				
	(1) t sin at (2) t cosh at				
	(3) t cos at (4) t sinh at				

Question No.	Questions					
95.	If $F_s(s)$ and $F_c(s)$ are Fourier sine and cosine transforms of $f(t)$, respectively, then which is correct?					
	(1) $F_s[f(t)\cos at] = \frac{1}{2}[F_s(s+a) + F_s(s-a)]$					
	(2) $F_s[f(t)\cos at] = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$					
	(3) $F_s[f(t) \sin at] = \frac{1}{2} [F_s(s+a) + F_s(s-a)]$					
	(4) None of these					
96.	Which of the following symbols in C - Language represents logical operator?					
	(1) == (2) &&					
	(3) % (4) >=					
97.	The purpose of strrev () function in C – Language is to					
	(1) Compare two strings (2) Find length of a string					
	(3) Reverse the string (4) Copy one string over the other.					
98.	Which of the following is an unconditional control transfer statement?					
	(1) if statement (2) goto statement					
	(3) if-else statement (4) switch statement					

Question No.	Questions Which of the following statement is incorrect?			
99.				
	(1) while (condition) {	(2) do {		
	statement(s);	statement(s);		
	}	} while (condition);		
	(3) switch (expression)			
	{			
	case exp 1:			
	statement block-1			
	break;			
	case exp 2:			
	statement block-2			
	break;			
	default:			
	default block			
	}			
	statement t;			
	(4) None of these			
100.	To send the value of variable us	ing pointers is known as		
	(1) Recursion	(2) Call by reference		
	(3) Getw function	(4) None of these		



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(CPG-EE-2017)

Subject: MATHEMATICS

arks: 100 (in words)	
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Time: 11/2 Hours

Total Questions: 100

Max. M

Sr. NO 120

SET-"A"

Roll No. _____ (in figure)

Name: _____ Date of Birth: ____

Father's Name: _____ Mother's Name:____

Date of Examination:

(Signature of the candidate)

(Signature of the Invigilator)

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1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.

The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour 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.

In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.

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 book-let itself. Answers MUST NOT be ticked in the Question book-let.

Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-Sheet.

There will be Negative marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

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Question No.	Questions				
1.	Cayley's theorem states that				
	(1) Every finite group is isomorphic to a				
	(2) Every finite group is isomorphic to a	a quotient group			
	(3) Every subgroup of a cyclic group is	cyclic			
	(4) The order of each subgroup of a finition of the group.	te group is a divisor of the order			
2.	The ring of even integers is also a				
	(1) Field (2) Int	egral domain			
	(3) Division ring (4) Con	mmutative ring			
3.	A division ring has at least elements.				
	(1) 1 (2) 2				
	(3) 3 (4) No	ne of these			
4.	The number of trivial subgroups of a cyclic group of order 8 is				
	(1) 0 (2) 1				
	(3) 2 (4) 3				
5.	The transverse component of acceleration	on is given by			
	$(1) \frac{1}{r} \frac{d}{dt} \left(r^2 \frac{d\theta}{dt} \right) \qquad (2) \frac{d^2}{dt}$	$\frac{r}{2} - r \left(\frac{d\theta}{dt}\right)^2$			
	(3) $\frac{d^2r}{dt^2} + r\left(\frac{d\theta}{dt}\right)^2$ (4) $r\frac{d\theta}{dt}$	$\frac{d^2\theta}{dt^2} - 2\frac{dr}{dt}\frac{d\theta}{dt}$			

Question No.				Que	stions	201
6.	A p	article exe tance 2 cm	cuting a S.H from the cen	.M. has a	acceleration 8 cm/sec ² whe	en it is at
	(1)	$\frac{2}{\pi}$ sec.		(2)	$\frac{1}{\pi}$ sec.	
	(3)	$\frac{\pi}{2}$ sec.		(4)	π sec.	
7.	chil	ld. If the we	gs the scoote	r to stop cooter to	h a speed of 10 m/sec, a clo, 4 seconds just in time to gether with the man is 20 scooter?	0 00 41
		300 N		(2)	400 N	
	(3)	500 N		(4)	600 N	
8.	If the	ne greatest ge, then the	height attair e angle of pro	ned by a jection is	projectile be equal to the sigven by	horizonta
	(1)	$\tan^{-1}\left(\frac{1}{4}\right)$		(2)	tan ⁻¹ 4	
	(0)				and the same of th	
	(3)	tan-1 2		(4)	$\tan^{-1}\left(\frac{1}{2}\right)$	
9.			l equation of			force per
9.	The	differentia	l equation of olar form is g	a centra	$\tan^{-1}\left(\frac{1}{2}\right)$ al orbit under P as central (Here $u = \frac{1}{r}$ and h is con	force per
	The	differentia	olar form is g	a centra	al orbit under P as central	force per stant).

Question No.	Questions					
10.	Which is not correct?					
	(1) Relative to the sun, the planets describe ellipses with the sun as one focus.					
	(2) The radius vector drawn from the sun to a planet sweeps out areas at a constant rate					
	(3) The square of the periodic times are proportional to the semi-major axis of the elliptic orbits and hence also to the mean distances from the sun.					
	(4) If a particle moves under the action of a conservative system of forces, the sum of its kinetic and potential energies remain constant throughout the motion.					
11.	The value of Bessel's function $J_{\frac{1}{2}}$ (x) is given by					
	(1) $\sqrt{\frac{2}{\pi x}} \sin x$ (2) $\sqrt{\frac{2}{\pi x}} \cos x$					
	(3) $\sqrt{\frac{\pi x}{2}} \sin x$ (4) None of these					
12.	If P_n (x) is Legendre polynomial, then which of the following is not correct?					
	(1) $P_0(x) = 1$ (2) $P_1(x) = x$					
	(3) $P_n(-x) = (-1)^n P_n(x)$ (4) None of these					
13.	The value of $\int_{-1}^{+1} P_n^2(x) dx$ is equal to					
	(1) 0 (2) $\frac{2}{2n+1}$					
	(3) $\frac{2}{n+1}$ (4) 1					

Question No.	Questions
14.	Inverse Laplace transform of $\left[\frac{s^2-a^2}{(s^2+a^2)^2}\right]$ is
	(1) t sin at (2) t cosh at
	(3) t cos at (4) t sinh at
15.	If $F_s(s)$ and $F_c(s)$ are Fourier sine and cosine transforms of $f(t)$ respectively, then which is correct?
	(1) $F_s[f(t)\cos at] = \frac{1}{2}[F_s(s+a) + F_s(s-a)]$
	(2) $F_s[f(t)\cos at] = \frac{1}{2}[F_c(s+a) + F_c(s-a)]$
	(3) $F_s[f(t) \sin at] = \frac{1}{2} [F_s(s+a) + F_s(s-a)]$
	(4) None of these
16.	Which of the following symbols in C - Language represents logical operator?
	(1) == (2) &&
	(3) % (4) >=
17.	The purpose of strrev () function in C - Language is to
	(1) Compare two strings (2) Find length of a string
	(3) Reverse the string (4) Copy one string over the other.
18.	Which of the following is an unconditional control transfer statement?
	(1) if statement (2) goto statement
	(3) if-else statement (4) switch statement

Question No.	Questions Which of the following statement is incorrect?				
19.					
	(1) while (condition) {	(2)	do {		
	statement(s);		statement(s);		
	}		} while (condition);		
	(3) switch (expression)				
	{				
	case exp 1:				
	statement block-1				
	break;				
	case exp 2:				
	statement block-2				
	break;				
	<u></u>				
	default:				
	default block				
	}.				
	statement t;				
	(4) None of these				
20.	To send the value of variable	e using p	ointers is known as		
	(1) Recursion	(2)	Call by reference		
	(3) Getw function	(4)	None of these		

Question No.	Questions					
21.	If $x = a (\theta - \sin \theta)$; $y = a (1 - \cos \theta)$, then the value of $\frac{dy}{dx}$ will be					
	(1) $\tan \frac{\theta}{2}$ (2) $\tan \theta$					
	(3) $\cot \frac{\theta}{2}$ (4) $\cot \theta$					
22.	Let $f(x) = \sqrt{x^2 - 4}$, $x \in [2, 4]$, then which of the following is true for $f(x)$?					
	(1) Roll's Theorem is applicable					
	(2) Lagrange's Mean Value Theorem is applicable					
	(3) There exists at least one $C = 2\sqrt{3}$ in (2, 4)					
	(4) All the above are true.					
23.	$\lim_{a \to b} \frac{a^b - b^a}{a^a - b^b} \text{ is}$					
	$\frac{1-\log b}{\log b}$					
	(1) $\frac{1 - \log b}{1 + \log b}$ (2) $\frac{1 - \log b}{1 + \log a}$					
	(3) $\log \frac{a}{b}$ (4) None of these					
24.	If $u = \log \left(\frac{x^2 + y^2}{x + y} \right)$, then $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is equal to					
	(1) 0 (2) u					
	(3) 1 (4) e ^u					

Question No.		Qı	uest	ions		
25.	Which is not correct? (where symbols have their usual meanings in differential geometry).					
	(1)	$\frac{d\vec{t}}{ds} = k\vec{n}$	(2)	$\frac{d\vec{b}}{ds} = -$	τñ	
	(3)	$\frac{d\vec{n}}{ds} = \tau \vec{b} - k \vec{t}$	(4)	r '. r ''' =	=k ²	
26.	The	particular integral of $(D^2 - 2)$	DD	') z = si	n (x + 2y) is	
	(1)	$\frac{1}{6}\sin\left(x+2y\right)$	(2)	$\frac{1}{3}\sin$	(x + 2y)	
	(3)	$\frac{1}{6}\cos\left(x+2y\right)$	(4)	None	of these	
27.	The	partial differential equation				
		$\frac{\partial^2 z}{\partial x^2} - 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0 \text{is}$				
	(1)	Parabolic	(2)	Hyper	rbolic	
	(3)	Elliptic	(4)	None	of these	
28.	The	characteristic equations of				
		$\frac{\partial^2 \mathbf{u}}{\partial \mathbf{x}^2} - 2 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{x} \partial \mathbf{y}} - 8 \frac{\partial^2 \mathbf{u}}{\partial \mathbf{y}^2} = 0$				
	are	given by				
	(1)	$\frac{dy}{dx} - 2 = 0 \text{ and } \frac{dy}{dx} - 4 = 0$		(2)	$\frac{dy}{dx} - 2 = 0 \text{ and } \frac{dy}{dx} + 4 = 0$	
	(3)	dy + 2 dx = 0 and dy - 4 dx	= 0	(4)	None of these	

Question No.	Questions
29.	The equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = \frac{1}{c^2} \frac{\partial^2 u}{\partial t^2}$ is called
	(1) One dimensional heat equation
	(2) Two dimensional heat equation
	(3) Two dimensional wave equation
	(4) Laplace equation
30.	Solution of $yp - xq = y^2 - x^2$ is
	(1) $\phi(x^2 + y^2, xy - z) = 0$ (2) $\phi(xy, x^2 + y^2 + z^2) = 0$
	(3) $\phi\left(\frac{1}{x} - \frac{1}{y}, \frac{x - y}{z}\right) = 0$ (4) None of these
31.	The centre of the sphere $x^2 + y^2 + z^2 - 4x + 6y - 8z + 4 = 0$ is
	(1) $(2, -3, 4)$ (2) $(-2, 3, -4)$
	$(3) (-4, 6, -8) \qquad \qquad (4) (4, -6, 8)$
32.	The equation of the right circular cone whose axis is $x = y = z$, vertex is the origin and the semi-vertical angle is 45° is given by
	(1) $(x^2 + y^2 + z^2) = 3 (x + y + z)^2$ (2) $2 (x + y + z)^2 = 21 (x^2 + y^2 + z^2)$
	(3) $3(x^2 + y^2 + z^2) = 2(x + y + z)^2$ (4) $x^2 + y^2 + z^2 = \frac{1}{2}$
	(3) $3(x^2 + y^2 + z^2) = 2(x + y + z)^2$ (4) $x^2 + y^2 + z^2 = \frac{1}{2}$

uestion No.	Questions		
33.	The equation of the cylinder, whose generators are parallel to the line		
	$\frac{x}{1} = \frac{y}{-2} = \frac{z}{3}$ and whose guiding curve is the	ellipse $x^2 + 2y^2 - 1$, $z = 0.15$	
	given by		
	(1) $(3z - x)^2 + 2(2z + 3y)^2 = 9$ (2) $(3x - z)^2 + 2(2z + 3y)^2 = 9$	$(2)^2 + 2(3y + 2z)^2 = 9$	
	(3) $(3x + z)^2 + 2(3y - 2z)^2 = 9$ (4) None	of these	
34.	The equation of the tangent to the parabola	$y^2 + 4y + 20x = 0$ at $(0, 0)$ is	
	(1) $y = 2x$ (2) $y = 5x$		
	(3) $x - 5y = 0$ (4) $y + 5x$	= 0	
35.	The equation $\frac{x^2}{a^2} - \frac{y^2}{b^2} = \frac{2z}{c}$, represents		
	(1) Hyperboloid of one sheet (2) Ellipt	ic Paraboloid	
	(3) Hyperbolic Paraboloid (4) Ellips	그리아들이 가다 아니네를 그 게임 때문에 다른 것이 아니는 가장 없다.	
36.	$(n^7 - n)$ is divisible by	Appendix to the second	
	(1) 1 (2) 7		
	(3) 30 (4) 42	CAST CAN WELL A	
37.	Congruence $33x \equiv 22 \pmod{11}$ has		
	(1) 3 solutions (2) 11 so	lutions	
	(a) O solutions	ations	
38.	3. If p is a prime number and 'a' denotes an integer such that (a,		
	$a^{p-1} \equiv 1 \pmod{p}$		
	is known as		
	(1) Fermat's Theorem (2)	Wilson's Theorem	
	(3) Chinese Remainder Theorem (4)	None of these	

Questions				
The value of $\frac{(\cos \theta + i \sin \theta)^6}{(\cos \theta - i \sin \theta)^4}$ is				
(1) 1 (2) 0				
(3) $\cos 10 \theta + i \sin 10 \theta$ (4) $\cos 2\theta + i \sin 2\theta$				
Which is not correct?				
(1) $\sin (ix) = i \sinh x$ (2) $\operatorname{sech} \theta = \frac{2}{e^{\theta} - e^{-\theta}}$				
(3) $\tanh \theta = \frac{e^{\theta} - e^{-\theta}}{e^{\theta} + e^{-\theta}}$ (4) $\cosh^2 x - \sinh^2 x = 1$				
With respect to standard basis vectors, a linear transformation				
$T: I R^4 \to IR^3$ is given by the matrix $\begin{bmatrix} 3 & -1 & -1 & 1 \\ -2 & 2 & -2 & -2 \\ -1 & 1 & 3 & -1 \end{bmatrix}$				
The dimension of Ker (T) is				
(1) 1 (2) 2				
(3) 3 (4) 4				
The norm of x with respect to inner product space < x, x > is given by				
(1) $ x = \langle x, x \rangle$ (2) $ x = \langle x, x \rangle^2$				
(3) $ x ^2 = \langle x, x \rangle$ (4) None of these				

Question No.	Questions			
43.	Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statements implies that T is bijective?			
	 (1) Rank (T) - Nullity (T) = n (2) Rank (T) + Nullity (T) = n (3) Rank (T) = Nullity (T) = n (4) None of these 			
44.	Let V be an inner product space, then $ < u, v> \le u . v $ for all $u, v \in V$, is known as			
	 (1) Bessel's Inequality (2) Cauchy Schwarz inequality (3) Triangle inequality (4) None of these 			
45.	Given that $\begin{array}{ c c c c c c c c c c c c c c c c c c c$			
	(1) 3 (2) 9 (3) 5 (4) 2			
46.	The order of convergence of Regula-Falsi method is (1) 2 (2) 1.5			
	(3) 1.618 (4) 2.98			
47.	f (x) is given by $\begin{array}{ c c c c c c c c c c c c c c c c c c c$			
	rule, the value of $\int_{0}^{2} f(x) dx$ is			
	(1) 1.075 (2) 1.575			
	(3) 0.775 (4) 2.150			

Question No.	Questions				
48.	Consider the initial value problem $\frac{dy}{dx} = -x y$; y (0) = 1. Then Taylor series solution upto x^4 is				
	(1) $y = 1 + \frac{x^2}{2} + \frac{x^4}{8}$ (2) $y = x + \frac{x^2}{2} + \frac{x^4}{6}$				
	(3) $y = 1 + \frac{x^3}{6} + \frac{x^4}{8}$ (4) None of these				
49.	The Mean and Variance are same for a distribution namely:				
	(1). Binomial distribution				
	(2) Poisson's distribution				
	(3) Normal distribution				
	(4) None of these				
50.	If X follows binomial distribution with mean 3 and variance $\frac{3}{2}$, the value of P (X \leq 5) is				
	. 1				
	(1) $\frac{1}{64}$ (2) $\frac{1}{8}$				
	(3) $\frac{63}{64}$ (4) None of these				
51.	If a function f be bounded on [a, b], then				
	(1) f is necessarily R-integrable				
	(2) f is R-integrable if $[a, b] \subset N$				
	(3) f is not necessarily R-integrable				
	(4) f is R-integrable if $[a, b] = N \cup \phi$				

Question No.			Ques	tions	
52.	If f be a monotonic function, then				
	(1)	f be R-integrable	(2)	f be R-	integrable if $f \neq 0$
	(3)	f be bounded	(4)	All the	above
53.	b	is integrable on $Ix = F(b) - F(a)$ is s		s the p	rimitive of f on [a, b], then
	(1)	First Mean Value	theorem		
	(2)	Fundamental the	eorem of integr	al calcu	lus
	(3)	Baire's Category	theorem		
	(4)	None of these			
54.	The integral $\int_{0}^{\pi/2} \frac{\sin x}{x^n} dx$ converges if				
	(1)	n < 1	(2)	n > 1	
	(3)	n > 2	(4)	n < 2	
55.	If on	a non-empty set	$X, d: X \times X \rightarrow$	R be a	function such that
		$d(x, y) = \begin{cases} 0 & \text{if } x = 1 \\ 1 & \text{if } x = 1 \end{cases}$	y then		engualementale Caracterian a ATC
	(1)	(X, d) is a semi-n	netric space	(2)	(X, d) is a metric-space
	(3)	(X, d) is not a me	etric-space	(4)	None of these
56.	The	derived set for th	the set $S = \left\{ \frac{1}{n} \right\}$	$n \in \mathbb{N}$ i	S
	(1)	R	(2)	N	
	(3)	{0}	(4)	$\{0, \infty\}$	

Question No.	Questions			
57.	The statement "Every complete metric space is of the second category as a subset of itself" refers to			
	(1) Baire's Category Theorem			
	(2) Cantor's intersection Theorem			
	(3) Bolzano-Weierstrass property			
	(4) None of these			
58.	The set $G = \{1, w, w^2\}$, where w is a cube root of unity, with respect to multiplication is a			
	(1) Group (2) Abelian group			
	(3) Cyclic group (4) All of these			
59.	If H and K are two non-empty subsets of abelian group G, then HK is a subgroup of G if			
	(1) H is a subgroup of G			
	(2) K is a subgroup of G			
Tie	(3) $H \cap K$ is subgroup of G			
	(4) Has well as Kare subgroups of G.			
60.	If p is a prime, then any group G of order 2p has			
	(1) a normal subgroup of order p			
	(2) a normal subgroup of order 2p			
	(3) a normal subgroup of order p ²			
	(4) None of these			
61.	If $u = x + y$, and $v = (x + y)^2$, then value of $\frac{\partial (u, v)}{\partial (x, y)}$ is			
	(1) 0 (2) $4(x+y)^2$			
	(3) x (4) $\frac{1}{x}$			

CPG-EE-2017-Mathematics-Code-D

Question No.	Questions
62.	The value of Beta function $\beta\left(\frac{1}{2},\frac{1}{2}\right)$ is
	$(1) \sqrt{2\pi} \qquad \qquad (2) \pi \sqrt{2}$
	(3) $\sqrt{\pi}$ (4) π
63.	The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is given by
	(1) π ab (2) 2π ab
	(3) $\pi a^2 b$ (4) πab^2
64.	The Fourier series for the function $f(x) = x , -\pi \le x \le \pi$ contains
	(1) only sine terms (2) only cosine terms
	(3) both sine and cosine terms (4) None of these
65.	The Harmonic conjugate of u (x, y) = $\frac{y}{x^2 + y^2}$ is
	(1) $\frac{x}{x^2 + y^2}$ (2) $\frac{-x}{x^2 + y^2}$
	(3) $\frac{1}{x^2 + y^2}$ (4) $x^2 - y^2$
66.	The fixed points of the mapping $w = \frac{(5Z + 4)}{(Z + 5)}$ are
	(1) 2, 2 (2) -2, -2
	(3) 2, -2 (4) None of these

Question No.	Questions			
67.	The bilinear transformation that maps the points $z = \infty$, i, 0 into the points $w = 0$, i and ∞ is given by			
	(1) $w = z$ (2) $w = -z$			
	(3) $w = \frac{1}{z}$ (4) $w = -\frac{1}{z}$			
68.	For a non-empty subset W of a vector space V(F), which of the following is incorrect?			
	(1) W be subspace if $u - v \in W$, a $u \in W$ for $u, v \in W$, $a \in F$			
	(2) W be subspace iff $au + bv \in W$ for $u, v \in W$; $a, b \in F$			
	(3) The union of any two subspaces of V(F) is a subspace			
	(4) None of these			
69.	Which of the following set form the basis of R ³ :			
	(1) $\{(2, 3, 1), (7, -6, 17), (5, 2, 7)\}$ (2) $\{(2, 1, 4), (1, -1, 2), (3, 1, -2)\}$			
	(3) $\{(1, -1, 3), (1, 2, -3), (1, 0, 1)\}$ (4) None of these			
70.	Which of the following functions T from $V_2(R)$ into $V_2(R)$ is not a linear transformation?			
10.54	(1) $T(x, y) = (y, x)$ (2) $T(x, y) = (x + y, x)$			
	(3) $T(x, y) = (x - y, y - x)$ (4) $T(x, y) = (1 + x, y)$			
71.	The resultant of two forces P and Q act at right angles to P, the angle between the forces is			
	(1) $\cos^{-1}\left(-\frac{P}{Q}\right)$ (2) $\tan^{-1}\left(-\frac{P}{Q}\right)$			
	(3) $\sin^{-1}\left(-\frac{Q}{P}\right)$ (4) $\cos^{-1}\left(\frac{P}{Q}\right)$			

Question No.	Questions			
72.	Three forces 2P, 3P and 4P act at a point in direction parallel to the sides of an equilateral triangle taken in order. Magnitude of the resultant			
	is (1) 3P (2) 2P			
	(3) $\sqrt{17}$ P (4) $\sqrt{3}$ P			
73.	If the normal reaction is 10 units and limiting friction is 5 units, then the coefficient of friction is			
	(1) 2 (2) $\frac{2}{3}$			
	(3) $\frac{1}{2}$ (4) None of these			
74.	Suppose a system of forces is reduced to a single force \vec{R} and a Couple of			
	moment \vec{k} whose axis coincides with the direction of acting force, then \vec{R}			
	and \vec{k} taken together are called			
	(1) Null line (2) Wrench (3) Pitch (4) None of these			
	(6) 11001			
75.	The condition that the straight line $\frac{x-f}{\ell} = \frac{y-g}{m} = \frac{z-h}{n}$ may be a null line			
	for the system of forces (X, Y, Z; L, M, N) is			
	X Y Z			
	(1) ℓ m n = $L\ell + Mm + Nn$			
	f g h			
12 01	x y z			
	$ (2) \ell m n = -(L\ell + Mm + Nn) $			
	X Y Z			
	(3) Lx + My + Nz = 0			
	(4) None of these			

Question No.	Questions		
76.	The greatest lower bound of $\left\{ \left(1 + \frac{1}{n}\right)^n \right\}$ is		
	(1) 0 (2) 2		
	(3) 1 (4) None of these		
77.	The sequence $\left\{\frac{2n-7}{3n+2}\right\}$ is		
	(1) Monotonic increasing, and is bounded.		
	(2) Monotonic decreasing, and is bounded.		
	(3) Monotonic increasing and is not bounded.		
	(4) Monotonic decreasing and is not bounded.		
78.	The series whose n th term is $(\sqrt{n^3+1}-\sqrt{n^3})$ is		
	(1) Divergent (2) Convergent		
	(3) Oscillatory (4) None of these		
79.	If $\sum u_n$ is a series of positive terms and if $\lim_{n\to\infty} (u_n)^{\frac{1}{n}} = \ell$, then the series divergent if		
	$(1) \ell > 1 \qquad (2) \ell < 1$		
	(3) $\ell \le 1$ (4) None of these		
	"A series obtained from an absolutely convergent series by a rearrangement of terms converges absolutely and has the same sum as the original series", is statement of a theorem known as		
	(1) Riemann's rearrangement theorem (2) Dirichlet's theorem		
	(3) Pringsheim's theorem (4) Cauchy's theorem		

Question No.	Questions
81.	Solution of differential equation $(y - px)^2 = 1 + p^2$, is
	(1) $y = cx^2 + \sqrt{1-p^2}$ (2) $y = px + \sqrt{1+p^2}$
	(3) $y = px - tan^{-1}c$ (4) $y = cx + \sqrt{1+c^2}$, is constant
82.	P dx + x sin y dy = 0 is exact, then $P can be$
	$(1) \sin y + \cos y \qquad (2) -\sin y$
	(3) $x^2 - \cos y$ (4) $\cos y$
83.	The general solution of the differential equation $(D^2 + 6D + 9)$ y = 5 e^{2x} is
	(1) $y = (c_1 + c_2 x) e^{3x} + 5 e^{2x}$ (2) $y = (c_1 + c_2 x) e^{-3x} + \frac{1}{5} e^{2x}$
	(3) $y = (c_1 + c_2 x) e^{-3x} + e^{2x}$ (4) $y = (c_1 + c_2 x) e^{3x} + \frac{e^{2x}}{3}$
84.	The solution of the differential equation $x^2 \frac{d^2y}{dx^2} - 3x \frac{dy}{dx} + 4y = 0$ is
	(1) $y = (c_1 + c_2 \log x) x^2$ (2) $y = (c_1 + c_2 x) e^{2x}$
	(3) $y = c_1 x^2 + \frac{c_2}{x}$ (4) $y = (c_1 + c_2 x) e^{-x}$
85.	The orthogonal trajectory of family of curves y = ax ² is
	(1) $x^2 + y^2 = a^2$ (2) $x^2 + 2y^2 = a^2$
	(3) $2x^2 + y^2 = a^2$ (4) $\frac{x^2}{a^2} - \frac{y^2}{a^2} = 1$

Question No.	Questions					
86.						
	(1) 1 $(2) -2$					
	(3) -3 $(4) -4$					
87.	The value of λ so that the vector $\vec{F} = (x + 3y)\hat{i} + (y - 2z)\hat{j} + (x + \lambda z)\hat{k}$ is a solenoidal vector, is given by					
	(1) 2 (2) 3					
	(3) -2 $(4) 1$					
88.	Which is not correct? (Here r, θ , z are cylindrical coordinates and \hat{e}_r , \hat{e}_{θ} , \hat{e}_z are unit vectors in these coordinates),					
	(1) $\frac{d}{dt} \hat{e}_r = \dot{\theta} \hat{e}_{\theta}$ (2) $\frac{d}{dt} \hat{e}_{\theta} = -\dot{\theta} \hat{e}_r$					
	(3) $\hat{\mathbf{e}}_{\mathbf{r}} = \cos \theta \hat{\mathbf{i}} + \sin \theta \hat{\mathbf{j}}$ (4) $\hat{\mathbf{e}}_{\theta} = \cos \theta \hat{\mathbf{i}} - \sin \theta \hat{\mathbf{j}}$					
89.	If $\vec{R} = x \hat{i} + y \hat{j} + z \hat{k}$, and if S is closed surface enclosing a volume V, where \hat{n} is the outward drawn unit-normal vector to the surface S, then $\iint_S \vec{R} \cdot \hat{n} dS \text{ is equal to}$					
	(1) 4V (2) 3V					
	(3) 2V (4) V					
90.	Stoke's theorem is a relation between					
	(1) Line integral and Surface integral					
	(2) Line integral and Volume integral					
	(3) Surface integral and Volume integral					
	(4) None of these					

Question No.	Questions			
91.	If matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 2 & 3 \end{bmatrix}$, then A^2 is equal to $\begin{bmatrix} -1 & -2 & -3 \end{bmatrix}$			
	(1) $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ (2) $\begin{bmatrix} -1 & -2 & -3 \\ 1 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$			
	(3) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (4) $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 0 & 1 \end{bmatrix}$			
92.	If $A = \begin{bmatrix} 0 & 4 & -2 \\ x & 0 & -y \\ 2 & -8 & 0 \end{bmatrix}$ is a skew-symmetric matrix, then $x - y = \dots$ is			
	(1) 8 (2) 4			
93.	 (3) -12 (4) -8 If 3x + 2y + z = 0; x + 4y + z = 0; 2x + y + 4z = 0, be a system of equations, then (1) It is inconsistent (2) It can be reduced to a single equation and so a solution does not exist. (3) It has only the trivial solution x = 0, y = 0, z = 0 (4) The determinant of the matrix of coefficient is zero. 			

Question No.	QUESTIONS					
94.	The condition that the cubic equation $x^3 - px^2 + qx - r = 0$ has all of its three roots equal is given by					
	(1)	$p^2 = 3qr$	(2)	$q^2 = 3pr$		
	(3)	$r^2 = 3pq$	(4)	None of these		
95.	Which of the following is not correct?					
	(1) Every square matrix satisfies its own characteristic equation.					
	(2) If λ is an eigen-value of a matrix A, then $\frac{1}{\lambda}$ is the eigen-value of the matrix A^{-1} .					
	(3) The sum of the eigen-values of a matrix is equal to the sum of elements of principal diagonal.					
	(4) The matrices A and A ^T have different eigen-values.					
96.	Which of the following function f (x) is differentiable at the origin:					
100	(1)	f(x) = x	(2)	$f(x) = x^{\frac{2}{3}}$		
	(3)	$f(x) = \begin{cases} x \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$	(4)	$f(x) = e^{-1/x^2}$		
97.	The curve $2x^2 - 3xy - 2y^2 = 1$ has two asymptotes that are					
	(1)	Perpendicular	(2)	Parallel		
	(3)	Intersect at an angle 60°	(4)	None of these		

Question No.	Questions				
98.	The radius of curvature of the curve $y = e^x$ at the point where it crosses the y-axis is				
	(1) 2	$(2) \frac{\sqrt{2}}{2}$			
	(3) $2\sqrt{2}$	$(4) \sqrt{2}$			
99.	For the curve y ² (1 -	$(x) = x^2 (1 - x)$, the origin is a			
	(1) Cusp	(2) Point of inflexion			
	(3) Node	(4) None of these			
100.	segment $y = 2x$ from (1) $\pi \sqrt{5}$	of the solid generated by the revolution of the li x = 0 to x = 2, about x-axis is equal to (2) $2\pi\sqrt{5}$	ine		
	(3) $4\pi\sqrt{5}$	(4) $8\pi \sqrt{5}$			

Ar	swer Kev of	Mathematics E	ntrance CEE-2	017
Question No.	CODE-A	CODE-B	CODE-C	CODE-D
1	3	1	1	1
2	2	3	4	2
3	3	2	3	2
4	2	4	2	3
5	4	3	1	1
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8	3	1	2	2
9	3	3	1	1
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		4	1	
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48	2	2	4	1
49	1	3	4	2
50	2	2	1	3

Checker + varied way 24/66/17.

Α	nswer Key of	Mathematics E	ntrance CEE-2	017
Question No.	CODE-A	CODE-B	CODE-C	CODE-D
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95	4	1	1	4
)6	3	3	2	2
97	1	4	3	1
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9	2	2	4	3
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