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## (CPG-EE-2019)

Subject: Math.

sr. No. 10357

Code

Total Questions: 100 Max. Marks: 100 Time: 1½ Hours Roll No. \_\_\_\_\_ (in figure)\_\_\_\_ (in words) Name: \_\_\_\_\_ Date of Birth: \_\_\_\_ Father's Name: \_\_\_\_\_ Mother's Name: Date of Examination:

(Signature of the candidate)

(Signature of the Invigilator)

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

All questions are compulsory and carry equal marks. The candidates are require

to attempt all questions.

The candidates must return the Question book-let as well as OMR answer-shee to the Invigilator concerned before leaving the Examination Hall, failing which case of use of unfair-means / mis-behaviour will be registered against him / hen in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

Question Booklet along-with answer key of all the A,B,C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

The candidate MUST NOT do any rough work or writing in the OMR Answer-5. 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 ENSURÉ 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.

Question No.	Questions				
1.	If $A^2 - A + I = 0$ , then the inverse of A is				
	(1) A – I (2) A + I				
	(3) A (4) I – A				
2.	If A and B are invertible matrices of the same order, such that AB = BA then A and B are				
	(1) Similar (2) dissimilar				
	(3) have different eigen values (4) none of these				
3.	The nature of quadratic form 2xy + 2yz + 2zx is				
	(1) Indefinite (2) Definite				
	(3) Positive definite (4) Negative definite				
4.	For what real value of 'k' the following equations have non-zero solution:				
	x + 2y + 3z = kx, $3x + y + 2z = ky$ , $2x + 3y + z = kz$				
	(1) -3 (2) 4				
	(3) 5 (4) 6				
5.	If $\alpha$ , $\beta$ , $\gamma$ are the roots of the equation $x^3 + 3x - 3 = 0$ , then the value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$ is:				
	(1) $\frac{3}{4}$ (2) 0				
	(3) $\frac{4}{3}$ (4) $\frac{1}{4}$				

Question No.	Questions
6.	The vertical and horizontal asymptotes of $y = \frac{x}{x-2}$ are
	(1) $x = 2, y = 1$ (2) $x = 2, y = -1$
	(3) $x = -2, y = -1$ (4) $x = 2, y = 2$
7.	The radius of curvature at the origin for the curve $x^3 + y^3 = 3axy$ is equal to
	(1) 2a (2) 2a/3
	(3) 1 (4) 3a/2
8.	The point of inflexion of the curve $y^2 = x (x + 1)^2$ is
	(1) $\left(\frac{1}{3}, \frac{4}{3\sqrt{3}}\right)$ (2) $\left(\frac{2}{3}, -\frac{4}{3\sqrt{3}}\right)$
	(3) $\left(\frac{2}{3}, \left(\frac{5\sqrt{2}}{3\sqrt{3}}\right)\right)$ (4) None of these
9.	The area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is equal to
	(1) 5/8 (2) 9/8
	(3) 1/3 (4) 8/3
10.	The volume of the solid generated by the revolution of $r=2a\cos\theta$ about the initial line is equal to :
	(1) $\frac{2\pi a^3}{3}$ (2) $\frac{4\pi a^3}{3}$
	(3) $\frac{8\pi a^3}{3}$ (4) None of these

Question No.	Questions					
11.	The	The value of $\phi$ (462), where $\phi$ is an Euler's function, is equal to				
	(1)	120 (2)	) :	160		
	(3)	32 (4)	) 4	480		
12.		value of d ( $p^2 q^3$ ) =, where distinct primes.	ere	e d(n) i	s divisor function of n and p,	
	(1)	241 (2)	) ]	16	,	
	(3)	12 (4)	) ]	None o	of these	
13.	The	statement "If p is a prime nur wn as:	nbe	er, the	$n (p-1)! + 1 \equiv 0 \text{ (modp)}$ is	
	(1)	Wilson's Theorem	(	(2)	Fermat's Theorem	
	(3)	Chinese Remainder Theorem	(	(4)	None of these	
14.	The	value of cosh (x + iy) =				
	(1)	$\cos x \cosh y - i \sin x \sinh y$				
	(2)	$\sin x \cosh y + i \cos x \sinh y$				
	(3)	$\cosh x \cos y + i \sinh x \sin y$		æ.,		
	(4)	$\sinh x \cos y + i \cosh x \sin y$				
15.	tan <sup>-</sup>	$-1\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) =$		Miller (In with Miller and Artiffer and Artiffer (In which are in a week and in a week		
	(1)	$\frac{\pi}{3}$ (2) $\frac{\pi}{4}$ (4)	)	$\frac{\pi}{2}$		
	(3)	$\frac{\pi}{4}$ (4)	) ]	None (	of these	

Question No.	Questions		
16.	The differential equation $(y^2e^{xy^2} + 6x) dx + (2xye^{xy^2} - 4y) dy = 0$ is		
	(1) linear, homogeneous and exact		
	(2) non-linear, homogeneous and exact-		
	(3) non-linear, non-homogeneous and exact		
	(4) non-linear, non-homogeneous and inexact		
17.	Integrating factor of the differential equation $\frac{dx}{dy} + \left(\frac{3x}{y}\right) = \frac{1}{y^2}$ is		
ø	(1) $e^{y^3}$ (2) $y^3$		
	(1) $e^{y}$ (2) $y^{3}$ (3) $x^{3}$ (4) $-y^{3}$		
18.	The solution of the differential equation $y = px + p^2$ , where $p = \frac{dy}{dx}$ is		
	(1) $y = cx + c - c^2$ (2) $y = cx + c^2$		
7	(3) $y = cx - e^c$ (4) $y = cx - c^2$		
19.	The orthogonal trajectory for the family of curves $r = a (1 + \sin \theta)$ is		
۰	(1) $r = c (1 + \cos \theta)$ (2) $r = c (1 - \cos \theta)$		
	(3) $r = c (1 - \sin \theta)$ (4) $r = c (1 + \sin \theta)$		
20.	The particular integral of differential equation $(D^2 - 4)$ y = sin 3x,		
	$D = \frac{d}{dx} is$		
	(1) 1/4 (2) -1/13		
	(3) 1/5 (4) None of these		

Question No.	Questions			
21.	The value of $\hat{i} \times (\hat{j} \times \hat{k})$ is equal to			
	$(1) -1 \qquad (2)$	1		
v.	(3) 0 (4)	± 1		
22.	The value of curl (grad f), where $f = 2$	$2x^2 - 3y^2 + 4z^2$ is		
	(1) $4x - 6y + 8z$ (2)	$4x \hat{i} - 6y \hat{j} + 8z \hat{k}$		
	(3) 3 (4)	0		
23.	The value of $\int \operatorname{grad}(x+y-z) dr$ from	(0, 1, -1) to (1, 2, 0) is		
	(1) 0 (2)	3		
	(3) -1 (4)	not obtainable		
24.	The magnitude of the vector dra $x^2 + 2y^2 + z^2 = 7$ at the point $(1, -1, 2)$			
	(1) 2/3 (2)	3/2		
	(3) 3 (4)	6		
25.	The value of $\lambda$ so that the vector solenoidal vector is	$(x+3y)\hat{i} + (y-2z)\hat{j} + (x+\lambda z)\hat{k}$ is a		
	(1) -2 $(2)$	3		
	(3) 1 (4)	None of these		

Question No.	Questions			
26.	What conic does the equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represent?			
	(1) an ellipse (2) circle			
	(3) pair of straight lines (4) hyperbola			
27.	Section of a sphere by a plane is			
	(1) parabola (2) ellipse			
	(3) circle (4) none of these			
28.	The equation $2(x^2 + y^2 + z^2) - 2xy + 2yz + 2zx = 3a^2$ represents a			
	(1) cone (2) right-circular cylinder			
	(3) sphere (4) pair of planes			
29.	The radius of the great circle of a sphere is			
	(1) greater than the radius of the sphere			
	(2) less than the radius of the sphere			
	(3) equal to the radius of the sphere			
	(4) none of these			
30.	The nature of the section of the central conicoid $ax^2 + by^2 + cz^2 = 1$ by the plane $\ell x + my + nz = p$ is a hyperbola if:			
	(1) $bc\ell^2 + cam^2 + abn^2 < 0$ (2) $ba\ell^2 + cbm^2 + acn^2 < 0$			
	(3) $bcm^2 + can^2 + ab\ell^2 < 0$ (4) $bc\ell^2 + cam^2 + abn^2 > 0$			

Question No.	Questions
31.	The value of 'c' of the Lagrange's mean value theorem for $f(x) = x(x-1)(x-2)$ in $(0, 1/2)$ is
	(1) 0.126 (2) 0.236
8 2	(3) 0.345 (4) 0.464
32.	If $u = f(y/x)$ , then
·	(1) $x \frac{\partial u}{\partial x} - y \frac{\partial u}{\partial y} = 0$ (2) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$
-	(3) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ (4) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$
33.	Expansion of $e^x$ cos y in powers of x and y upto first degree by Taylor series is :
	(1) $1 + x$ (2) $1 + y$
	(3) 1 + x + y (4) None of these
34.	A stationary point of $f(x, y) = x^2 - xy + y^2 - 2x + y$ is:
	(1) (1, 1) (2) (1, 0)
	(3) (0, 1) (4) (-1, 0)
35.	The equation of the tangent plane to the surface $z = xy$ at the point $(2, 3, 6)$ is
	(1) $2x + 3y - z = 6$ (2) $3x + 2y + z = 6$
	(3) $3x + 2y - z = 6$ (4) $3x + 2y - z = 3$

Question No.	Questions			
36.	The partial differential equation obtained from $z = f(x^2 - y^2)$ is:			
	(1) $p + q = 0$ (2) $px + qy = 0$			
,	(3) $py + qx = 0$ (4) $px = qy$			
37.	Complete solution of $p + q = x + y$ is:			
	(1) $z = x + y - k + c$ (2) $2z = (x + k)^2 (y - k)^2 + c$			
	(3) $z = k (x + y) + c$ (4) None of these			
38.	General solution of $(y-z) p + (z-x) q = x-y$ is:			
	(1) $f(x+y+z, x^2+y^2+z^2)=0$ (2) $f(xy, x+y+z)=0$			
	(3) $f\left(\frac{x+y}{z}, \frac{y}{z}\right) = 0$ (4) None of these			
39.	The particular integral of $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$ is:			
	$(1) \cos x \qquad \qquad (2) \sin x + \cos x$			
	$(3)  \sin x - \cos x \qquad (4)  -\sin x$			
40.	The real characteristics of the partial differential equation			
ve v	$\frac{\partial^2 z}{\partial x^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0 \text{ is}$			
ä	(1) $2y - 3x = c$ (2) $y + x = c_1$ , $y - 2x = c_2$ (3) $y - 2x = c$ (4) $y - x = c$			
	(3) $y - 2x = c$ (4) $y - x = c$			

Question No.	Questions				
41.	What is the angle between two equal forces P and P, when the square of				
	their	resultant is equal to (2 $-$	$\sqrt{3}$ ) t	imes their product?	
	(1)	130°	(2)	140°	
	(3)	145°	(4)	150°	
42.	-	t is the resolved part of ing an angle equal to tan-1		ee equal to 60 kg wt. in a direction ith its direction?	
	(1)	48 kg wt.	(2)	40 kg wt.	
	(3)	52 kg wt.	(4)	None of these	
43.		es forming a couple are eac of an equivalent couple ea		and its arm is 1 m. What will be the whose force is 3N?	
	(1)	1 m	(2)	4/3 m	
	(3)	3/4 m	(4)	None of these	
44.	At what point of a tree must one end of a rope of given length '\ell' be attached so that a man pulling at the other end with a given force may have the greatest tendency to pull it over?				
2	(1)	$\frac{\ell}{2}$ $\frac{\ell}{\sqrt{2}}$	(2)	$\sqrt{\ell}/2$	
	(3)	$\ell/\sqrt{2}$	(4)	$\ell$	
45.	Six equal rods AB, BC, CD, DE EF and FA are each of weight W and are freely joined so as to form a hexagon. The rod AB is fixed in a horizontal position and the middle point of AB and DE are joined by a string. The tension in the string is:				
	(1)	3W	(2)	$\sqrt[3]{\sqrt{3}}$	
	(3)	3√3 W	(4)	$\sqrt{3} \text{ W/}_2$	

Question No.	Questions				
46.	If (G, •) is a group and a, b are any element of G, then				
	(1) order of 'ab' is less than order of 'ba'				
0	(2) order of 'ab' is equal to order of 'ba'				
	(3) order of 'ab' is greater than order of 'ba'				
	(4) none of these				
47.	If H and K are two subgroups of a group G, then HK is a subgroup of G iff				
	(1) $HK = 1$ (2) $HK = H^{-1}K^{-1}$				
	(3) · HK = KH (4) None of these				
48.	How many generators are there of the cyclic group of order 10?				
	(1) 2 (2) 4				
	(3) 5 (4) 6				
49.	The identity permutation is				
	(1) even permutation (2) odd permutation				
	(3) neither even nor odd (4) none of these				
50.	If I is a ideal in ring R, then				
	(1) R/I is a ring (2) RI is a ring				
	(3) R + I is a ring (4) None of these				

Question No.	Questions			
51.	If R is an Euclidean ring and a, $b \in R$ . If $b \neq 0$ is not a unit in R, then			
	(1) d (a) < d (ab) (2) d (a) > d (ab)			
7	(3) d (a) = d (ab) (4) None of these			
52.	If integral domain I is of finite characteristic, then			
	(1) I is finite only (2) I is infinite only			
	(3) I is finite or infinite (4) None of these			
53.	If $J_n(x)$ is the Bessel function of first kind, then $\int_0^{\pi} [J_{-2}(x) - J_2(x)] dx =$			
	(1) $2$ (2) $-2$			
	(3) 0 (4) 1			
54.	The polynomial $2x^2 + x + 3$ in terms of Legendre polynomials is			
	(1) $\frac{1}{3}(4P_2 - 3P_1 + 11P_0)$ (2) $\frac{1}{3}(4P_2 + 3P_1 - 11P_0)$			
	(3) $\frac{1}{3}(4P_2+3P_1+11P_0)$ (4) $\frac{1}{3}(4P_2-3P_1-11P_0)$			
55.	$L^{-1}$ (1/s <sup>n</sup> ) is possible only when 'n' is			
	(1) zero (2) negative integer			
	(3) positive integer (4) negative rational			
	·			

Question No.	Questions
56.	Laplace transform of t <sup>2</sup> e <sup>-3t</sup> is
	(1) $\frac{1}{(s+3)^3}$ (2) $\frac{2}{(s+3)^2}$
,	(3) $\frac{3}{(s+3)^3}$ (4) $\frac{2}{(s+3)^3}$
57.	$\int_0^\infty \frac{\mathrm{dx}}{(x^2+1)^2} =$
	(1) $\frac{\pi}{2}$ (2) $\pi/4$
	(3) 1 (4) 0
58.	If $f(x) = x + 1$ , $x \in [1, 3]$ and $P = \{1, 2, 3\}$ be a partition of P, then L (f, P) and U (f, P) are respectively:
	(1) 3, 6 (2) 6, 3
	(3) 7, 5 (4) 5, 7
59.	If f is Riemann integrable on [a, b], then
	(1) $\left  \int_{a}^{b} f(x) dx \right  \le \int_{a}^{b} \left  f(x) \right  dx$ (2) $\left  \int_{a}^{b} f(x) dx \right  \ge \int_{a}^{b} \left  f(x) \right  dx$
	(3) $\left  \int_a^b f(x) dx \right  = \int_a^b \left  f(x) \right  dx$ (4) None of these
60.	$\int_a^\infty \frac{\sin x}{\sqrt{x}} dx, \text{ where } a > 0 \text{ is :}$
	(1) convergent (2) divergent
	(3) oscillatory (4) proper

CPG-EE--2019--Mathematics--Code--A

Question No.	Questions	
61.	Which of the following statements is not correct?	
	(1) The real line is a complete metric space	
	(2) The complex plane with the usual metric is complete.	
	(3) The space of continuous functions on [a, b] is complete.	
34	(4) The space of rational numbers with the usual metric is complete.	
62.	Let A and B be any two sets of a metric space. Then	
	(1) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$ (2) $(A \cup B)^{\circ} = A^{\circ} \cup B^{\circ}$	
	(3) $\overline{A \cap B} = \overline{A} \cap \overline{B}$ (4) $(A \cap B)' = A' \cap B'$	
63.	Any totally bounded metric space is	
	(1) separable (2) not bounded	
	(3) not complete (4) not separable	
.64.	Every convergent sequence is:	
	(1) bounded and Cauchy (2) bounded but not Cauchy	
	(3) not bounded but Cauchy (4) none of the above	
65.	Which of the following sets of Vectors in R <sup>3</sup> (R) is linearly independent over R	
	(1) $\{(1, -2, 1), (2, 1, -1), (7, -4, 1)\}$	
	(2) {(1, 1, 1), (0, 4, 1), (3, 0, 1)}	
	(3) $\{(2, 3, 1), (-1, 4, -2), (1, 18, -4)\}$	
	$(4)  \{(0, 2, -4), (1, -2, -1), (1, -4, 3)\}$	

Question No.	Questions
66.	Let $W_1$ and $W_2$ be finite dimensional subspaces of a vector space V. If $\dim W_1 = 2$ , $\dim W_2 = 2$ , $\dim (W_1 + W_2) = 3$ , then $\dim (W_1 \cup W_2)$ is
	(1) 1 (2) 2
-	(3) 3 (4) 4
67.	If x, y, z are in AP with common difference 'd' and the rank of the matrix
	$\begin{bmatrix} 4 & 5 & \mathbf{x} \end{bmatrix}$
	5 6 y is 2, then the value of 'd' and 'k' are 6 k z
	(1) $d = x/2$ ; k is arbitrary (2) d an arbitrary number; $k = 7$
	(3) $d = k$ ; $k = 5$ (4) $d = x/2$ ; $k = 6$
	(-)
68.	Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation given by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$ then, rank T is
	(1) 0 (2) 1
	(3) 2 (4) 3
69.	Let U and V be two vector spaces over the field F. If $T_1:U\to V$ and $T_2:U\to V$ be two linear transformations, then
2.	(1) $\rho(T_1 + T_2) \le \rho(T_1) + \rho(T_2)$ (2) $\rho(T_1 + T_2) \ge \rho(T_1) + \rho(T_2)$
	(3) $\rho (T_1 + T_2) \neq \rho (T_1) + \rho (T_2)$ (4) None of these
70.	If $A = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix}$ , then $A^9$ is equal to
	(1) 511 A + 510 I (2) 309 A + 105 I
	(3) 154 A + 510 I (4) None of these

Question No.	Questions
71.	Let x and y be vectors in an inner product space, then
	(1) $\ \mathbf{x} + \mathbf{y}\ ^2 + \ \mathbf{x} - \mathbf{y}\ ^2 = \ \mathbf{x}\ ^2 + \ \mathbf{y}\ ^2$
	(2) $\ \mathbf{x} + \mathbf{y}\ ^2 + \ \mathbf{x} - \mathbf{y}\ ^2 = 2(\ \mathbf{x}\ ^2 + \ \mathbf{y}\ ^2)$
	(3) $\ \mathbf{x} + \mathbf{y}\ ^2 + \ \mathbf{x} - \mathbf{y}\ ^2 = \ \mathbf{x}\ ^2 \ \mathbf{y}\ ^2$
	(4) $\ \mathbf{x} + \mathbf{y}\ ^2 + \ \mathbf{x} - \mathbf{y}\ ^2 = \ \mathbf{x}\ ^2 - \ \mathbf{y}\ ^2$
72.	$\int_0^{\pi/2} \sin^6 \theta \cos^7 \theta  d\theta =$
12.	$\int_0^{\pi} \sin \theta \cos \theta d\theta = 0$
	$(1)  \frac{32}{3003} \qquad (2)  \frac{8}{3003}$
	$(3)  \frac{40}{3003} \qquad \qquad (4)  \frac{16}{3003}$
73.	If $u = x^2 - y^2$ , $v = 2xy$ and $x = r \cos \theta$ , $y = r \sin \theta$ , then the value of
	$\frac{\partial (u, v)}{\partial (r, \theta)}$ is
	(1) $2 r^2$ (2) $4 r^3$
	(3) $r \cos \theta$ (4) $r \sin 2\theta$
74.	$\int_0^1 \int_{x^2}^{2-x} xy  dx  dy =$
	(1) 3/8 (2) 1/3
	(3) 5/8 (4) 5/3
75.	The half-range cosine series for $f(x) = x$ , $0 \le x \le \pi$ is
,	$x = \frac{\pi}{2} - \frac{4}{\pi} \sum_{n} is \text{ odd} \left( \frac{\cos nx}{n^2} \right)$ , then the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$ is
	(1) $\frac{\pi^2}{6}$ (2) $\frac{\pi^2}{8}$ (3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$
	(3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$

CPG-EE-2019-Mathematics-Code-A

Question No.	Questions
76.	The analytic region of $f(z) = (x - y)^2 + 2i(x + y)$ is
	(1) $x + y = 1$ (2) $y = x$
	(3) $x-y=1$ (4) none of these
77.	The transformation $w = z + 2 - 2i$ is
	(1) conformal at each point
	(2) not conformal at $z = 0$
	(3) does not satisfy C – R equations
	(4) None of these
78.	The analytic function $f(z) = u + iv$ has real part $u = e^x \sin y$ is:
	(1) $e^z + c$ (2) $i e^z + c$
	(3) $-i e^z + c$ (4) $2 i e^z + c$
79.	Which of the following sets is an open set?
	(1) $A = \{\frac{1}{n} : n \in \mathbb{N}\}\$ (2) $A = \{x : 2 \le x < 3\}$
	(3) $A = \{x : 0 \le x \le 1\}$ (4) $A = \{x : x \ne x\}$
80.	If $\{a_n\}$ converges and $\{b_n\}$ diverges, then $\{a_n + b_n\}$
190 (0	(1) converges (2) diverges
	(3) oscillates (4) none of these

Question No.	Questions
81.	Which of the following sequences whose nth terms are given below is not a Cauchy sequence?
	(1) $1/n$ (2) $\frac{n}{n+1}$
	(3) $\frac{(-1)^n}{n}$ (4) $(-1)^n n$
82.	The series $\sum (3n-1)^{-1}$ is
	(1) convergent (2) divergent
	(3) oscillates (4) none of these
83.	If $\sum u_n$ converges or oscillates between finite limits and $a_1$ , $a_2$ , $a_3$ ,, is a decreasing sequence of positive terms tends to zero as a limit, then $\sum a_n u_n$ is
	(1) convergent (2) divergent
	(3) oscillates (4) none of these
84.	As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called
	(1) Gauss-Jordan method (2) Jacobi method
	(3) Gauss-Seidal method (4) Relaxation method
85.	For the data:
*	x     3     6     9     12       f(x)     -1     1     2     3
	The value of $\int_3^{12} f(x) dx$ when computed by Simpson's one-third rule is
	(1) 15 <b>(2)</b> 10
	(3) 0 <b>(4)</b> 5

(2) (4)	3x 0	
(4)	0 .	
	•	
$\frac{x_n}{2} + \frac{9}{8x_n}$ wi	$th x_0 = 0.5$ obtained from	n the Newton-
(2)	1.5	
(4)	$\sqrt{2}$	
the variance	$e$ σ <sup>2</sup> and mean $\mu$ are rel	ated by
(2)	$\sigma^2 = \mu / q$	
(4)	None of these	
if $2P(x=1)$	= P (x = 2), then the	variance is
(2)	-1	
(4)	2	
shows the	e correct hierarchy o	of arithmetic
(2)	(), **, *, /, +, -	
(4)	(),/or*,-or+	
	(2) (4) the variance (2) (4) if 2P (x = 1) (2) (4) shows the	$\frac{x_n}{2} + \frac{9}{8x_n} \text{ with } x_0 = 0.5 \text{ obtained from the seconverges to}$ $(2)  1.5$ $(4)  \sqrt{2}$ $(2)  \sigma^2 = \mu / q$ $(4)  \text{None of these}$ $(2)  -1$ $(4)  2$ $(3)  -1$ $(4)  2$ $(4)  2$ $(4)  (4)  2$ $(4)  (5)  (7)  $

Question No.	Questions	
91.	Function declaration statement identifies a function with its	
The server trained in	(1) name (2) arguments	
	(3) data type of return value (4) all of these	
92.	Which is invalid C constant?	
	(1) 0.5 (2) '1052'	
	(3) 0515 (4) 'a'	
93.	What will be the output of the following program	
	main()	
×	{	
	Int $i=4$ , $z=12$ ;	
	If $(i=5 \&\& z>5)$	
	printf("\nLet us C");	
	else	
	printf('\nWish C was free!");	
	(1) Let us C (2) Wish C was free!	
	(3) Error in the program (4) None of these	
94.	An array is a collection of	
	1) different data types scattered throughout memory	
	(2) the same data type scattered throughout the memory	
	(3) the same data type placed next to each other in memory	
	4) different data type placed next to each other in memory	
95.	What will be the tangential acceleration at $t = 3$ when the particle move along the curve $x = 4t$ , $y = 6t - t^2$ ?	
	1) 0 (2) 2 unit/sec <sup>2</sup>	
	3) -2 unit/sec <sup>2</sup> (4) None of these	

Question No.	Questions
96.	The acceleration of a particle, moving with S.H.M. is 44 m/sec <sup>2</sup> when its distance from the mean position is 1/4 m. The time of an oscillation is:
	(1) $\pi$ sec (2) $\pi/2$ sec
2.	(3) $\pi/4$ sec (4) None of these
97.	A body of mass 50 kg is acted upon by a force of 5 N. How long will it take to attain a velocity of 30 m/sec.
	(1) 5 min (2) 3 min
	(3) 10 min (4) 6 min
98.	The work done in stretching an elastic string of natural length $\ell_0$ and of modulus of elasticity $\lambda$ to a length $\ell$ is:
	(1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$
	(3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$
99.	If the time of flight of a bullet over a horizontal range R is T seconds, then the inclination of the direction of projection to the horizontal is:
	(1) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (2) $\tan^{-1}\left(\frac{T^2}{2gR}\right)$
	(3) $\tan^{-1}\left(\frac{T^2 g}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2 g}{R}\right)$
100.	If a particle describes the equiangular spiral $r = a e^{\theta \cot \alpha}$ under a force F to the pole, then the law of force is:
(*)	(1) $F \propto r$ (2) $F \propto \frac{1}{r^2}$
	(3) $F \propto \frac{1}{r^3}$ (4) $F \propto \frac{1}{r^5}$

Opened for evaluation at 5:25pm

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(CPG-EE-2019)

Subject: Math.

Time: 1½ Hours

Date of Examination:

Code

**Total Questions: 100** 

Max. Marks 100

Roll No. (in figure)

Name:

Date of Birth:

Father's Name:

Mother's Name:

(Signature of the candidate)

(Signature of the Invigilator)

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

All questions are compulsory and carry equal marks. The candidates are requir

to attempt all questions. The candidates must return the Question book-let as well as OMR answer-shed 2.

to the Invigilator concerned before leaving the Examination Hall, failing which case of use of unfair-means /mis-behaviour will be registered against him / his in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.

Question Booklet along-with answer key of all the A,B,C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered/

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 FEN of good quality in the OMR Answer-Sheet.

There will be Negative marking. Each correct answer will be awarded one full 7. mark and each incorrect answer will be negatively marked for which the candidate will get 1/4 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 EPC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTANG OF THE EXAMINATION.

Question No.	Questions
1.	The value of $\phi$ (462), whose $\phi$ is an Eq. (
	The value of $\phi$ (462), where $\phi$ is an Euler's function, is equal to
	(1) 120 (2) 160
	(3) 32 (4) 480
2.	The value of d $(p^2 q^3) = \dots$ , where d(n) is divisor function of n and p, q are distinct primes.
	(1) 241 (2) 16
	(3) 12 (4) None of these
3.	The statement "If p is a prime number, then $(p-1)!+1 \equiv 0 \pmod{p}$ " is known as:
	(1) Wilson's Theorem (2) Fermat's Theorem
	(3) Chinese Remainder Theorem (4) None of these
4.	The value of $\cosh(x + iy) =$
	(1) $\cos x \cosh y - i \sin x \sinh y$
ac.	(2) $\sin x \cosh y + i \cos x \sinh y$
	(3) $\cosh x \cos y + i \sinh x \sin y$
	(4) $\sinh x \cos y + i \cosh x \sin y$
5.	$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) =$
•	(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{2}$
	(3) $\frac{\pi}{4}$ (4) None of these

CPG-EE--2019--Mathematics--Code--B

Question No.	Questions
6.	The differential equation $(y^2e^{xy^2} + 6x) dx + (2xye^{xy^2} - 4y) dy = 0$ is
	(1) linear, homogeneous and exact
	(2) non-linear, homogeneous and exact-
	(3) non-linear, non-homogeneous and exact
¥.,	(4) non-linear, non-homogeneous and inexact
7.	Integrating factor of the differential equation $\frac{dx}{dy} + \left(\frac{3x}{y}\right) = \frac{1}{y^2}$ is
	(1) $e^{y^3}$ (2) $y^3$
	(1) $e^{y^3}$ (2) $y^3$ (3) $x^3$ (4) $-y^3$
8.	The solution of the differential equation $y = px + p^2$ , where $p = \frac{dy}{dx}$ is
	(1) $y = cx + c - c^2$ (2) $y = cx + c^2$
10 No.	(3) $y = cx - e^c$ (4) $y = cx - c^2$
9.	The orthogonal trajectory for the family of curves $r = a (1 + \sin \theta)$ is
	(1) $r = c (1 + \cos \theta)$ (2) $r = c (1 - \cos \theta)$
E E	(3) $r = c (1 - \sin \theta)$ (4) $r = c (1 + \sin \theta)$
10.	The particular integral of differential equation $(D^2 - 4)$ y = sin 3x,
	$D = \frac{d}{dx} \text{ is}$
	(1) 1/4 (2) -1/13
	(3) 1/5 (4) None of these

Question No.	Questions	
11.	Function declaration statement identifies a function with its	
	(1) name (2) arguments	
	(3) data type of return value (4) all of these	
12.	Which is invalid C constant?	
	(1) 0.5 (2) '1052'	
	(3) 0515 (4) 'a'	
13.	What will be the output of the following program	
	main()	
	{	
	Int $i=4$ , $z=12$ ;	
	If (i=5 && z>5)	
	printf("\nLet us C");	
	else	
	printf("\nWish C was free!");	
	}	
	(1) Let us C (2) Wish C was free!	
	(3) Error in the program (4) None of these	
14.	An array is a collection of	
	(1) different data types scattered throughout memory	
	(2) the same data type scattered throughout the memory	
	(3) the same data type placed next to each other in memory	
	(4) different data type placed next to each other in memory	
15.	What will be the tangential acceleration at $t=3$ when the particle moves along the curve $x=4t$ , $y=6t-t^2$ ?	
	(1) 0 (2) 2 unit/sec <sup>2</sup>	
	(3) $-2 \text{ unit/sec}^2$ (4) None of these	

Question No.	Questions
16.	The acceleration of a particle, moving with S.H.M. is 44 m/sec <sup>2</sup> when its
	distance from the mean position is $1/4$ m. The time of an oscillation is : (1) $\pi$ sec (2) $\pi/2$ sec
	(1) $\pi$ sec (2) $\pi/2$ sec (3) $\pi/4$ sec (4) None of these
17.	A body of mass 50 kg is acted upon by a force of 5 N. How long will it take
1	to attain a velocity of 30 m/sec.
	(1) 5 min (2) 3 min
7.0	(3) 10 min (4) 6 min
18.	The work done in stretching an elastic string of natural length $\ell_0$ and of modulus of elasticity $\lambda$ to a length $\ell$ is :
	(1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$
	$(3)  \frac{\lambda \left(\ell + \ell_0\right)^2}{2 \ell_0} \qquad \qquad (4)  \frac{\lambda \ell_0}{2 \ell}$
19.	If the time of flight of a bullet over a horizontal range R is T seconds, then the inclination of the direction of projection to the horizontal is:
	(1) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (2) $\tan^{-1}\left(\frac{T^2}{2gR}\right)$
	(3) $\tan^{-1}\left(\frac{T^2 g}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2 g}{R}\right)$
20.	If a particle describes the equiangular spiral $r = a e^{\theta \cot \alpha}$ under a force F to the pole, then the law of force is :
	(1) $F \propto r$ (2) $F \propto \frac{1}{r^2}$
	(3) $F \propto \frac{1}{r^3}$ (4) $F \propto \frac{1}{r^5}$

		91
Question No.	Questions	
21.	Let x and y be vectors in an inner product space, then	
	(1) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 + \ y\ ^2$	
	20 CO	
1 6	(2) $\ x + y\ ^2 + \ x - y\ ^2 = 2(\ x\ ^2 + \ y\ ^2)$	
	(3) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 \ y\ ^2$	
	(4) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 - \ y\ ^2$	
22.	$\int_0^{\pi/2} \sin^6 \theta \cos^7 \theta  d\theta =$	
	$(1)  \frac{32}{3003} \qquad (2)  \frac{8}{3003}$	
	$(3)  \frac{40}{3003} \qquad \qquad (4)  \frac{16}{3003}$	ę.
23.	If $u = x^2 - y^2$ , $v = 2xy$ and $x = r \cos \theta$ , $y = r \sin \theta$ , then the	value of
9 94. <sup>5</sup>	$\frac{\partial (u, v)}{\partial (r, \theta)}$ is	
	(1) $2 r^2$ (2) $4 r^3$	2
	(3) $r \cos \theta$ (4) $r \sin 2\theta$	
24.	$\int_0^1 \int_{x^2}^{2-x} xy  dx  dy =$	
	(1) 3/8 (2) 1/3	
	(3) 5/8 (4) 5/3	
25.	The half-range cosine series for $f(x) = x$ , $0 \le x \le \pi$ is	
	$x = \frac{\pi}{2} - \frac{4}{\pi} \sum_{n} is odd \left( \frac{\cos nx}{n^2} \right)$ , then the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots$	is
	(1) $\frac{\pi^2}{6}$ (2) $\frac{\pi^2}{8}$ (3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$	* 10 * 10 - 1
	(3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$	

CPG-EE-2019-Mathematics-Code-B

Question No.	Questions
26.	The analytic region of $f(z) = (x - y)^2 + 2i(x + y)$ is
	(1) $x + y = 1$ (2) $y = x$
	(3) $x-y=1$ (4) none of these
27.	The transformation $w = z + 2 - 2i$ is
	(1) conformal at each point
	(2) not conformal at $z = 0$
	(3) does not satisfy $C - R$ equations
	(4) None of these
28.	The analytic function $f(z) = u + iv$ has real part $u = e^x \sin y$ is:
	(1) $e^z + c$ (2) $i e^z + c$
ox g	(3) $-i e^z + c$ (4) $2 i e^z + c$
29.	Which of the following sets is an open set?
, •	(1) $A = \{\frac{1}{n} : n \in N\}$ (2) $A = \{x : 2 \le x < 3\}$
,	(3) $A = \{x : 0 \le x \le 1\}$ (4) $A = \{x : x \ne x\}$
30.	If $\{a_n\}$ converges and $\{b_n\}$ diverges, then $\{a_n + b_n\}$
	(1) converges (2) diverges
	(3) oscillates (4) none of these

Question No.	Questions
110.	
31.	If R is an Euclidean ring and a, $b \in R$ . If $b \neq 0$ is not a unit in R, then
	(1) $d(a) < d(ab)$ (2) $d(a) > d(ab)$
	(3) $d(a) = d(ab)$ (4) None of these
32.	If integral domain I is of finite characteristic, then
	(1) I is finite only (2) I is infinite only
N	(3) I is finite or infinite (4) None of these
33.	If $J_n(x)$ is the Bessel function of first kind, then $\int_0^{\pi} [J_{-2}(x) - J_2(x)] dx =$
	(1) 2 (2) -2
	(3) 0 (4) 1
34.	The polynomial $2x^2 + x + 3$ in terms of Legendre polynomials is
	(1) $\frac{1}{3}(4P_2 - 3P_1 + 11P_0)$ (2) $\frac{1}{3}(4P_2 + 3P_1 - 11P_0)$
	(3) $\frac{1}{3}(4P_2+3P_1+11P_0)$ (4) $\frac{1}{3}(4P_2-3P_1-11P_0)$
35.	L-1 (1/sn) is possible only when 'n' is
9	(1) zero (2) negative integer
2	(3) positive integer (4) negative rational

Question No.	Questions
36.	Laplace transform of t <sup>2</sup> e <sup>-3t</sup> is
	(1) $\frac{1}{(s+3)^3}$ (2) $\frac{2}{(s+3)^2}$
	(3) $\frac{3}{(s+3)^3}$ (4) $\frac{2}{(s+3)^3}$
37.	$\int_0^\infty \frac{\mathrm{dx}}{(x^2+1)^2} =$
	(1) $\frac{\pi}{2}$ (2) $\pi/4$
	(3) 1 (4) 0
38.	If $f(x) = x + 1$ , $x \in [1, 3]$ and $P = \{1, 2, 3\}$ be a partition of P, then L (f, P) and U (f, P) are respectively:
	(1) 3, 6 (2) 6, 3
	(3) 7, 5 (4) 5, 7
39.	If f is Riemann integrable on [a, b], then
	(1) $\left  \int_{a}^{b} f(x) dx \right  \le \int_{a}^{b} \left  f(x) \right  dx$ (2) $\left  \int_{a}^{b} f(x) dx \right  \ge \int_{a}^{b} \left  f(x) \right  dx$
8	(3) $ \int_a^b f(x) dx  = \int_a^b  f(x)  dx$ (4) None of these
40.	$\int_a^\infty \frac{\sin x}{\sqrt{x}} dx, \text{ where } a > 0 \text{ is :}$
	(1) convergent (2) divergent
	(3) oscillatory (4) proper

CPG-EE-2019-Mathematics-Code-B

Question No.	Questions
41.	The value of 'c' of the Lagrange's mean value theorem for $f(x) = x(x-1)(x-2)$ in $(0, 1/2)$ is
	(1) 0.126 (2) 0.236
	(3) 0.345 (4) 0.464
42.	If $u = f(y/x)$ , then
	(1) $x \frac{\partial u}{\partial x} - y \frac{\partial u}{\partial y} = 0$ (2) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$
	(3) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ (4) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$
43.	Expansion of $e^x$ cos y in powers of x and y upto first degree by Taylor series is:
	(1) $1 + x$ (2) $1 + y$
	(3) $1+x+y$ (4) None of these
44.	A stationary point of $f(x, y) = x^2 - xy + y^2 - 2x + y$ is:
	(1) (1, 1) (2) (1, 0)
•	(3) (0, 1) (4) (-1, 0)
45.	The equation of the tangent plane to the surface $z = xy$ at the point $(2, 3, 6)$ is
	(1) $2x + 3y - z = 6$ (2) $3x + 2y + z = 6$
	(3) $3x + 2y - z = 6$ (4) $3x + 2y - z = 3$

Question No.	Que	stions	
46.	The partial differential equation obtained from $z = f(x^2 - y^2)$ is:		
	(1) $p + q = 0$ (2)	px + qy = 0	
	(3) $py + qx = 0$ (4)	px = qy	
47.	Complete solution of $p + q = x + y$ is:		
	(1) $z = x + y - k + c$ (2)	$2z = (x + k)^2 (y - k)^2 + c$	
	(3) $z = k (x + y) + c$ (4)	None of these	
48.	General solution of $(y - z) p + (z -$	x) q = x - y is:	
	(1) $f(x + y + z, x^2 + y^2 + z^2) = 0$	(2) $f(xy, x + y + z) = 0$	
	(3) $f\left(\frac{x+y}{z}, \frac{y}{z}\right) = 0$	(4) None of these	
49.	The particular integral of $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x^2}$	$\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x \text{ is :}$	
	(1) $\cos x$ (2)	$\sin x + \cos x$	
	$(3)  \sin x - \cos x \tag{4}$	-sin x	
50.	The real characteristics of the parti	al 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) $2y - 3x = c$ (2)	$y + x = c_1, y - 2x = c_2$	
*	(1) $2y - 3x = c$ (2) (3) $y - 2x = c$ (4)	y - x = c	

Question No.	Questions
51.	The value of $\hat{i} \times (\hat{j} \times \hat{k})$ is equal to
	(1) -1 $(2) 1$
	(3) 0 (4) ±1
52.	The value of curl (grad f), where $f = 2x^2 - 3y^2 + 4z^2$ is
	(1) $4x - 6y + 8z$ (2) $4x \hat{i} - 6y \hat{j} + 8z \hat{k}$
	(3) 3 (4) 0
53.	The value of $\int \operatorname{grad}(x+y-z)  dr$ from $(0, 1, -1)$ to $(1, 2, 0)$ is
	(1) 0 (2) 3
	(3) $-1$ (4) not obtainable
54.	The magnitude of the vector drawn perpendicular to the surface $x^2 + 2y^2 + z^2 = 7$ at the point $(1, -1, 2)$ is
	(1) 2/3 (2) 3/2
	(3) 3 (4) 6
55.	The value of $\lambda$ so that the vector $(x+3y)\hat{i}+(y-2z)\hat{j}+(x+\lambda z)\hat{k}$ is a solenoidal vector is
	(1) -2 $(2) 3$
	(3) 1 (4) None of these

Question No.			Ques	tions
56.	Wh	at conic does the equation	on 6	$x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$
	(1)	an ellipse	(2)	circle
	(3)	pair of straight lines	(4)	hyperbola
57.	Sec	tion of a sphere by a plane	is	
	(1)	parabola	(2)	ellipse
	(3)	circle	(4)	none of these
58.	The	equation $2(x^2 + y^2 + z^2) -$	2xy +	$2yz + 2zx = 3a^2$ represents a
	(1)	cone	(2)	right-circular cylinder
	(3)	sphere	(4)	pair of planes
59.	The	radius of the great circle of	of a sp	ohere is
	(1)	greater than the radius of	f the s	sphere
	(2)	less than the radius of the	spho	ere
	(3)	equal to the radius of the	sphei	re ·
	(4)	none of these		
60.	The nature of the section of the central conicoid $ax^2 + by^2 + cz^2 = 1$ by the plane $\ell x + my + nz = p$ is a hyperbola if:			
	(1)	$bc\ell^2 + cam^2 + abn^2 < 0$	(2)	$ba\ell^2 + cbm^2 + acn^2 < 0$
	(3)	$bcm^2 + can^2 + ab\ell^2 < 0$	(4)	$bc\ell^2 + cam^2 + abn^2 > 0$

Question No.	Questions		
61.	What is the angle between two equal forces P and P, when the square of		
	their resultant is equal to $(2-\sqrt{3})$ times their product?		
	(1) 130° (2) 140°		
	(3) 145° (4) 150°		
62.	What is the resolved part of a force equal to 60 kg wt. in a direction making an angle equal to tan <sup>-1</sup> 3/4 with its direction?		
	(1) 48 kg wt. (2) 40 kg wt.		
	(3) 52 kg wt. (4) None of these		
63.	Forces forming a couple are each 4 N and its arm is 1 m. What will be the arm of an equivalent couple each of whose force is 3N?		
	(1) 1 m (2) 4/3 m		
	(3) 3/4 m (4) None of these		
64.	At what point of a tree must one end of a rope of given length ' $\ell$ ' be attached so that a man pulling at the other end with a given force may have the greatest tendency to pull it over?		
	(1) $\frac{\ell}{2}$ (2) $\frac{\sqrt{\ell}}{2}$ (3) $\frac{\ell}{\sqrt{2}}$ (4) $\ell$		
,	$(3)  \sqrt[\ell]{\sqrt{2}} \qquad \qquad (4)  \ell$		
65.	Six equal rods AB, BC, CD, DE EF and FA are each of weight W and are freely joined so as to form a hexagon. The rod AB is fixed in a horizontal position and the middle point of AB and DE are joined by a string. The tension in the string is:		
Œ	(1) $3W$ (2) $\sqrt[W]{\sqrt{3}}$ (3) $3\sqrt{3}W$ (4) $\sqrt{3}W/2$		
	(3) $3\sqrt{3} \text{ W}$ (4) $\sqrt{3} \text{ W/}_2$		

Question No.	Questions
110.	
66.	If (G, •) is a group and a, b are any element of G, then
	(1) order of 'ab' is less than order of 'ba'
	(2) order of 'ab' is equal to order of 'ba'
	(3) order of 'ab' is greater than order of 'ba'
	(4) none of these
67.	If H and K are two subgroups of a group G, then HK is a subgroup of G
	(1) $HK = 1$ (2) $HK = H^{-1}K^{-1}$
	(3) HK = KH (4) None of these
68.	How many generators are there of the cyclic group of order 10?
	1) 2 (2) 4
	3) 5 (4) 6
69.	The identity permutation is
	1) even permutation (2) odd permutation
	3) neither even nor odd (4) none of these
70.	f I is a ideal in ring R, then
	l) R/I is a ring (2) RI is a ring
	B) R + I is a ring (4) None of these

Question No.	Questions	
71.	Thich of the following statements is not correct?	
	(1) The real line is a complete metric space	
	(2) The complex plane with the usual metric is complete.	
	(3) The space of continuous functions on [a, b] is complete.	
	(4) The space of rational numbers with the usual metric is complete.	
72.	Let A and B be any two sets of a metric space. Then	
	(1) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$ (2) $(A \cup B)^{\circ} = A^{\circ} \cup B^{\circ}$	
	(3) $\overline{A \cap B} = \overline{A} \cap \overline{B}$ (4) $(A \cap B)' = A' \cap B'$	
73.	Any totally bounded metric space is	
. **	(1) separable (2) not bounded	
	(3) not complete (4) not separable	
74.	Every convergent sequence is:	
	(1) bounded and Cauchy (2) bounded but not Cauchy	
	(3) not bounded but Cauchy (4) none of the above	
75.	Which of the following sets of Vectors in R <sup>3</sup> (R) is linearly independent over R	
	$(1)  \{(1,-2,1), (2,1,-1), (7,-4,1)\}$	
	(2) {(1, 1, 1), (0, 4, 1), (3, 0, 1)}	
	$(3)  \{(2, 3, 1), (-1, 4, -2), (1, 18, -4)\}$	
	$(4)  \{(0, 2, -4), (1, -2, -1), (1, -4, 3)\}$	

CPG-EE-2019-Mathematics-Code-B

Question	Questions
No.	
76.	Let $W_1$ and $W_2$ be finite dimensional subspaces of a vector space V. If dim $W_1 = 2$ , dim $W_2 = 2$ , dim $(W_1 + W_2) = 3$ , then dim $(W_1 \cup W_2)$ is
	(1) 1 (2) 2
	(3) 3 (4) 4
77.	If x, y, z are in AP with common difference 'd' and the rank of the matrix
	$\begin{bmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{bmatrix}$ is 2, then the value of 'd' and 'k' are
4	(1) $d = x/2$ ; k is arbitrary (2) d an arbitrary number; $k = 7$
	(3) $d = k$ ; $k = 5$ (4) $d = x/2$ ; $k = 6$
78.	Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation given by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$ then, rank T is
.	(1) 0 (2) 1
	(3) 2 (4) 3
79.	Let U and V be two vector spaces over the field F. If $T_1:U\to V$ and $T_2:U\to V$ be two linear transformations, then
	(1) $\rho(T_1 + T_2) \le \rho(T_1) + \rho(T_2)$ (2) $\rho(T_1 + T_2) \ge \rho(T_1) + \rho(T_2)$
	(3) $\rho(T_1 + T_2) \neq \rho(T_1) + \rho(T_2)$ (4) None of these
80.	If $A = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix}$ , then $A^9$ is equal to
	(1) 511 A + 510 I (2) 309 A + 105 I
	(3) 154 A + 510 I (4) None of these

Question No.	Questions		
81.	If $A^2 - A + I = 0$ , then the inverse of A is		
	(1) A – I (2) A + I		
	(3) A (4) I – A		
82.	If A and B are invertible matrices of the same order, such that $AB = BA$ then A and B are		
	(1) Similar (2) dissimilar		
	(3) have different eigen values (4) none of these		
83.	The nature of quadratic form 2xy + 2yz + 2zx is		
	(1) Indefinite (2) Definite		
	(3) Positive definite (4) Negative definite		
84.	For what real value of 'k' the following equations have non-zero solution:		
	x + 2y + 3z = kx, $3x + y + 2z = ky$ , $2x + 3y + z = kz$		
	(1) -3 (2) 4		
	(3) 5 (4) 6		
85.	If $\alpha$ , $\beta$ , $\gamma$ are the roots of the equation $x^3 + 3x - 3 = 0$ , then the value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$ is:		
	(1) $\frac{3}{4}$ (2) 0		
	(3) $\frac{4}{3}$ (4) $\frac{1}{4}$		

Question No.	Questions	
86.	The vertical and horizontal asymptotes of $y = \frac{x}{x-2}$ are	
	(1) $x = 2, y = 1$ (2) $x = 2, y = -1$	
	(3) $x = -2, y = -1$ (4) $x = 2, y = 2$	
87.	The radius of curvature at the origin for the curve $x^3 + y^3 = 3axy$ is equal to	
a.	(1) 2a (2) 2a/3	
	(3) 1 (4) 3a/2	
88.	The point of inflexion of the curve $y^2 = x (x + 1)^2$ is	
	(1) $\left(\frac{1}{3}, \frac{4}{3\sqrt{3}}\right)$ (2) $\left(\frac{2}{3}, -\frac{4}{3\sqrt{3}}\right)$	
	(3) $\left(\frac{2}{3}, \left(\frac{5\sqrt{2}}{3\sqrt{3}}\right)\right)$ (4) None of these	
89.	The area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is equal to	
	(1) 5/8 (2) 9/8	
	(3) 1/3 (4) 8/3	
90.	The volume of the solid generated by the revolution of $r=2a\cos\theta$ about the initial line is equal to :	
	(1) $\frac{2\pi a^3}{3}$ (2) $\frac{4\pi a^3}{3}$	
	(3) $\frac{8\pi a^3}{3}$ (4) None of these	

Question No.	Questions
91.	Which of the following sequences whose nth terms are given below is not a Cauchy sequence?
٠	(1) $1/n$ (2) $\frac{n}{n+1}$
	(3) $\frac{(-1)^n}{n}$ (4) $(-1)^n n$
92.	The series $\sum (3n-1)^{-1}$ is
	(1) convergent (2) divergent
	(3) oscillates (4) none of these
93.	If $\sum u_n$ converges or oscillates between finite limits and $a_1$ , $a_2$ , $a_3$ ,, is a decreasing sequence of positive terms tends to zero as a limit, then $\sum a_n u_n$ is
	(1) convergent (2) divergent
-	(3) oscillates (4) none of these
94.	As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called
	(1) Gauss-Jordan method (2) Jacobi method
	(3) Gauss-Seidal method (4) Relaxation method
95.	For the data:
	x 3 6 9 12
	f(x) -1 1 2 3
	The value of $\int_3^{12} f(x) dx$ when computed by Simpson's one-third rule is
	(1) 15 (2) 10
,	(3) 0 (4) 5

	Ques	tions
The value of $\frac{\Delta^2}{E}$ (x <sup>3</sup> ) is		
(1) 6x	(2)	3x
(3) 2x	(4)	0
Consider the series $x_{n+1} = \frac{x_n}{2}$	$+\frac{9}{8x}$ w	ith $x_0 = 0.5$ obtained from the Newton-
(1) 1.4	(2)	1.5
(3) 1.6	(4)	$\sqrt{2}$
In binomial distribution the	variance	e σ² and mean μ are related by
(1) $\sigma^2 = \mu q$	(2)	$\sigma^2 = \mu / q$
$(3)  q^2  \sigma^2 = \mu$	(4)	None of these
In a Poisson distribution if 2	P(x=1)	) = P (x = 2), then the variance is
(1) 0	(2)	
(3) 4	(4)	2
Which of the following shows the correct hierarchy of arithmetic operations in C		
(1) (), **, * or /, + or –	(2)	(), **, *, /, +, _
(3) (), **, /, * +, =	(4)	(), / or *, - or +
	(1) $6x$ (3) $2x$ Consider the series $x_{n+1} = \frac{x_n}{2}$ Raphson method. The series (1) $1.4$ (3) $1.6$ In binomial distribution the (1) $\sigma^2 = \mu q$ (3) $q^2 \sigma^2 = \mu$ In a Poisson distribution if 2 (1) $0$ (3) $4$ Which of the following shoperations in C (1) $()$ , **, * or /, + or $-$	The value of $\frac{\Delta^2}{E}$ (x³) is  (1) 6x (2) (3) 2x (4)  Consider the series $x_{n+1} = \frac{x_n}{2} + \frac{9}{8x_n}$ w. Raphson method. The series conversed (1) 1.4 (2) (3) 1.6 (4)  In binomial distribution the variance (1) $\sigma^2 = \mu q$ (2) (3) $q^2 \sigma^2 = \mu$ (4)  In a Poisson distribution if $2P(x = 1)$ (1) 0 (2) (3) 4 (4)  Which of the following shows the operations in C (1) (1) (2) (2)

Opened at 5:25 pm for evaluation.

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

## (CPG-EE-2019)

Subject: Math.

Sr. No.10359

SET-"Z"

Code



Max. Marks: 100 **Total Questions: 100** 

Time: 11/2 Hours (in words) (in figure) Roll No.

Date of Birth! Name: Mother's Name: Father's Name:

Date of Examination:

(Signature of the candidate)

(Signature of the Invigilator)

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

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

2. 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 / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not/be evaluated.

Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

Question Booklet along-with answer key of all the A,B,C and D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

The candidate MUST NOT do any rough work or writing in the OMR Answer-5. 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 7. 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 8. 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.

Jan Apper



Question No.	Questions		
1.	What is the angle between two equal forces P and P, when the square of		
	their resultant is equal to $(2-\sqrt{3})$ times their product?		
.	(1) 130° (2) 140°		
	(3) 145° (4) 150°		
2.	What is the resolved part of a force equal to 60 kg wt. in a direction making an angle equal to tan <sup>-1</sup> 3/4 with its direction?		
	(1) 48 kg wt. (2) 40 kg wt.		
	(3) 52 kg wt. (4) None of these		
3.	Forces forming a couple are each 4 N and its arm is 1 m. What will be the arm of an equivalent couple each of whose force is 3N?		
	(1) 1 m (2) 4/3 m		
	(3) 3/4 m (4) None of these		
4.	At what point of a tree must one end of a rope of given length '\ell' be attached so that a man pulling at the other end with a given force may have the greatest tendency to pull it over?		
e e	$(1)  \frac{\ell_2}{2} \qquad \qquad (2)  \frac{\sqrt{\ell_2}}{2}$		
	(1) $\frac{\ell}{2}$ (2) $\sqrt{\ell/2}$ (3) $\frac{\ell}{\sqrt{2}}$ (4) $\ell$		
5.	Six equal rods AB, BC, CD, DE EF and FA are each of weight W and are freely joined so as to form a hexagon. The rod AB is fixed in a horizontal position and the middle point of AB and DE are joined by a string. The tension in the string is:		
o •	(1) $3W$ (2) $\sqrt[W]{\sqrt{3}}$ (3) $3\sqrt{3}W$ (4) $\sqrt{3}W/2$		
	(3) $3\sqrt{3} \text{ W}$ (4) $\sqrt{3} \text{ W/}_2$		

Question No.	Questions	
6.	If (G, •) is a group and a, b are any element of G, then	
	(1) order of 'ab' is less than order of 'ba'	
	(2) order of 'ab' is equal to order of 'ba'	
e s	(3) order of 'ab' is greater than order of 'ba'	
	(4) none of these	
7.	If H and K are two subgroups of a group G, then HK is a subgroup of G iff	
V 2	(1) $HK = 1$ (2) $HK = H^{-1}K^{-1}$	
	(3) HK = KH (4) None of these	
8.	How many generators are there of the cyclic group of order 10?	
	(1) 2 (2) 4	
	(3) 5 (4) 6	
9.	The identity permutation is	
	(1) even permutation (2) odd permutation	
	(3) neither even nor odd (4) none of these	
10.	If I is a ideal in ring R, then	
	(1) R/I is a ring (2) RI is a ring	
	(3) R + I is a ring (4) None of these	

Question No.	G	Questions	
11.	The value of $\hat{i} \times (\hat{j} \times \hat{k})$ is equal to		
	(1) -1	(2) 1	
	(3) 0	(4) ± 1	
12.	The value of curl (grad f), wher	re $f = 2x^2 - 3y^2 + 4z^2$ is	1
	(1) $4x - 6y + 8z$	(2) $4x \hat{i} - 6y \hat{j} + 8z \hat{k}$	
	(3) 3	(4) 0	
13.	The value of $\int \operatorname{grad}(x+y-z) dr$	from $(0, 1, -1)$ to $(1, 2, 0)$ is	
	(1) 0	(2) 3	
	(3) -1	(4) not obtainable	
14.	The magnitude of the vector $x^2 + 2y^2 + z^2 = 7$ at the point (1,	r drawn perpendicular to the surfact $-1, 2$ ) is	e
	(1) 2/3	(2) 3/2	
:•8	(3) 3	(4) 6	
15.	The value of $\lambda$ so that the vesselenoidal vector is	ector $(x+3y)\hat{i}+(y-2z)\hat{j}+(x+\lambda z)\hat{k}$ is	a
	(1) -2	(2) 3	
	(3) 1	(4) None of these	

Question No.	Questions		
16.	What conic does the equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represent?		
,	(1) an ellipse (2) circle		
	(3) pair of straight lines (4) hyperbola		
17.	Section of a sphere by a plane is		
	(1) parabola (2) ellipse		
	(3) circle (4) none of these		
18.	The equation $2(x^2 + y^2 + z^2) - 2xy + 2yz + 2zx = 3a^2$ represents a		
	(1) cone (2) right-circular cylinder		
	(3) sphere (4) pair of planes		
19.	The radius of the great circle of a sphere is		
	(1) greater than the radius of the sphere		
	(2) less than the radius of the sphere		
-	(3) equal to the radius of the sphere		
,	(4) none of these		
20.	The nature of the section of the central conicoid $ax^2 + by^2 + cz^2 = 1$ by the plane $\ell x + my + nz = p$ is a hyperbola if:		
	(1) $bc\ell^2 + cam^2 + abn^2 < 0$ (2) $ba\ell^2 + cbm^2 + acn^2 < 0$		
	(3) $bcm^2 + can^2 + ab\ell^2 < 0$ (4) $bc\ell^2 + cam^2 + abn^2 > 0$		

Question No.	Questions
21.	If $A^2 - A + I = 0$ , then the inverse of A is
	(1) A – I (2) A + I
	(3) A (4) I – A
22.	If A and B are invertible matrices of the same order, such that AB = BA then A and B are
	(1) Similar (2) dissimilar
	(3) have different eigen values (4) none of these
23.	The nature of quadratic form 2xy + 2yz + 2zx is
	(1) Indefinite (2) Definite
e E	(3) Positive definite (4) Negative definite
24.	For what real value of 'k' the following equations have non-zero solution:
	x + 2y + 3z = kx, $3x + y + 2z = ky$ , $2x + 3y + z = kz$
	(1) -3 $(2) 4$
	(3) 5 (4) 6
25.	If $\alpha$ , $\beta$ , $\gamma$ are the roots of the equation $x^3 + 3x - 3 = 0$ , then the value of $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$ is:
	(1) $\frac{3}{4}$ (2) 0
	(3) $\frac{4}{3}$ (4) $\frac{1}{4}$

Question No.	Questions
26.	The vertical and horizontal asymptotes of $y = \frac{x}{x-2}$ are
	(1) $x = 2, y = 1$ (2) $x = 2, y = -1$
	(3) $x = -2, y = -1$ (4) $x = 2, y = 2$
27.	The radius of curvature at the origin for the curve $x^3 + y^3 = 3axy$ is equal to
	(1) 2a (2) 2a/3
,	(3) 1 (4) 3a/2
28.	The point of inflexion of the curve $y^2 = x (x + 1)^2$ is
	(1) $\left(\frac{1}{3}, \frac{4}{3\sqrt{3}}\right)$ (2) $\left(\frac{2}{3}, -\frac{4}{3\sqrt{3}}\right)$
	(3) $\left(\frac{2}{3}, \left(\frac{5\sqrt{2}}{3\sqrt{3}}\right)\right)$ (4) None of these
29.	The area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is equal to
	(1) 5/8 (2) 9/8
	(3) 1/3 (4) 8/3
30.	The volume of the solid generated by the revolution of $r=2a\cos\theta$ about the initial line is equal to :
	$(1)  \frac{2\pi a^3}{3} \qquad (2)  \frac{4\pi a^3}{3}$
	(3) $\frac{8\pi a^3}{3}$ (4) None of these

Question No.			Quest	cions
31.	Function declaration statement identifies a function with its			
	(1)	name	(2)	arguments
	(3)	data type of return value	(4)	all of these
32.	Whi	ich is invalid C constant?		
	(1)	0.5	(2)	'1052'
	(3)	0515	(4)	ʻa'
33.	Wh	at will be the output of the f	ollow	ing program
	mai	n()		•
	{			
		Int i=4, z=12;		
		If (i=5 && z>5)		
		printf("\nLet us C");		
	else	Fore manufacture land level " " year		
		printf('\nWish C was free!	!");	
	}	T	(0)	VVV. 1. G
	(1)	Let us C	(2)	Wish C was free!
	(3)	Error in the program	(4)	None of these
34.		array is a collection of	-	
	(1)	different data types scatte		
	(2)	the same data type scatte		
	(3)	the same data type placed		1 8 82 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	(4)	different data type placed		
35.	What will be the tangential acceleration at $t = 3$ when the particle moves along the curve $x = 4t$ , $y = 6t - t^2$ ?			
	(1)	0	(2)	2 unit/sec <sup>2</sup>
, .	(3)	- 2 unit/sec <sup>2</sup>	(4)	None of these

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	
36. The acceleration of a particle, moving with S.H.M. is 44 m/sec² when distance from the mean position is 1/4 m. The time of an oscillation is (1) $\pi$ sec (2) $\pi$ /2 sec (3) $\pi$ /4 sec (4) None of these  37. A body of mass 50 kg is acted upon by a force of 5 N. How long will it to attain a velocity of 30 m/sec. (1) 5 min (2) 3 min (3) 10 min (4) 6 min  38. The work done in stretching an elastic string of natural length $\ell_0$ are modulus of elasticity $\lambda$ to a length $\ell$ is:  (1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$ 39. If the time of flight of a bullet over a horizontal range R is T seconds, the inclination of the direction of projection to the horizontal is:  (1) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (2) $\tan^{-1}\left(\frac{T^2}{2gR}\right)$ (3) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2}{R}\right)$	
distance from the mean position is $1/4$ m. The time of an oscillation is $(1) \pi$ sec $(2) \pi/2$ sec $(3) \pi/4$ sec $(4)$ None of these  37. A body of mass 50 kg is acted upon by a force of 5 N. How long will it to attain a velocity of 30 m/sec.  (1) 5 min (2) 3 min (3) 10 min (4) 6 min  38. The work done in stretching an elastic string of natural length $\ell_0$ are modulus of elasticity $\lambda$ to a length $\ell$ is:  (1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$ 39. If the time of flight of a bullet over a horizontal range R is T seconds, the inclination of the direction of projection to the horizontal is:  (1) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (2) $\tan^{-1}\left(\frac{T^2}{2gR}\right)$ (3) $\tan^{-1}\left(\frac{T^2}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2}{R}\right)$	
(1) $\pi$ sec (2) $\pi/2$ sec (3) $\pi/4$ sec (4) None of these (3) $\pi/4$ sec (4) None of these (4) None of these (5) $\pi/4$ sec (5) $\pi/4$ sec (6) $\pi/4$ sec (7) $\pi/4$ sec (7) $\pi/4$ sec (8) $\pi/4$ sec (9) $\pi/4$ sec (9) $\pi/4$ sec (1)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	s:
37. A body of mass 50 kg is acted upon by a force of 5 N. How long will it to attain a velocity of 30 m/sec.  (1) 5 min (3) 10 min (4) 6 min  38. The work done in stretching an elastic string of natural length $\ell_0$ are modulus of elasticity $\lambda$ to a length $\ell$ is:  (1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$ 39. If the time of flight of a bullet over a horizontal range R is T seconds, the inclination of the direction of projection to the horizontal is:  (1) $\tan^{-1} \left(\frac{T^2}{2R}\right)$ (2) $\tan^{-1} \left(\frac{T^2}{2RR}\right)$ (3) $\tan^{-1} \left(\frac{T^2}{2R}\right)$ (4) $\tan^{-1} \left(\frac{T^2}{R}\right)$	
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$(1)   \tan^{-1}\left(\frac{T^2}{2R}\right)   (2)   \tan^{-1}\left(\frac{T^2}{2gR}\right)$ $(3)   \tan^{-1}\left(\frac{T^2 g}{2R}\right)   (4)   \tan^{-1}\left(\frac{T^2 g}{R}\right)$	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
(3) $\tan^{-1}\left(\frac{T^2 g}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2 g}{R}\right)$	
(3) $\tan^{-1}\left(\frac{T^2 g}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2 g}{R}\right)$	
40. If a particle describes the equiangular spiral $r = a e^{\theta \cot \alpha}$ under a force	Fto
the pole, then the law of force is:	
1	*
$(1)  F \propto r \qquad (2)  F \propto \frac{1}{r^2}$	
(3) $F \propto \frac{1}{r^3}$ (4) $F \propto \frac{1}{r^5}$	
$r^3$ $r^5$	

Question No.	Questions	
41.	Which of the following statements is not correct?	
	(1) The real line is a complete metric space	
	(2) The complex plane with the usual metric is complete.	
	(3) The space of continuous functions on [a, b] is complete.	
	(4) The space of rational numbers with the usual metric is complete.	
42.	Let A and B be any two sets of a metric space. Then	
	(1) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$ (2) $(A \cup B)^{\circ} = A^{\circ} \cup B^{\circ}$	
	(3) $\overline{A \cap B} = \overline{A} \cap \overline{B}$ (4) $(A \cap B)' = A' \cap B'$	
43.	Any totally bounded metric space is	
	(1) separable (2) not bounded	
	(3) not complete (4) not separable	
44.	Every convergent sequence is:	
	(1) bounded and Cauchy (2) bounded but not Cauchy	
	(3) not bounded but Cauchy (4) none of the above	
45.	Which of the following sets of Vectors in R <sup>3</sup> (R) is linearly independent over R	
	(1) $\{(1, -2, 1), (2, 1, -1), (7, -4, 1)\}$	
9	(2) {(1, 1, 1), (0, 4, 1), (3, 0, 1)}	
	$(3)  \{(2, 3, 1), (-1, 4, -2), (1, 18, -4)\}$	
	$(4)  \{(0, 2, -4), (1, -2, -1), (1, -4, 3)\}$	

Question No.	Questions
46.	Let $W_1$ and $W_2$ be finite dimensional subspaces of a vector space V. If dim $W_1 = 2$ , dim $W_2 = 2$ , dim $(W_1 + W_2) = 3$ , then dim $(W_1 \cup W_2)$ is
	(1) 1 (2) 2
	(3) 3 (4) 4
.47.	If x, y, z are in AP with common difference 'd' and the rank of the matrix
	$\begin{bmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{bmatrix}$ is 2, then the value of 'd' and 'k' are
1	(1) $d = x/2$ ; k is arbitrary (2) d an arbitrary number; $k = 7$
	(3) $d = k$ ; $k = 5$ (4) $d = x/2$ ; $k = 6$
48.	Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation given by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$ then, rank T is
-	(1) 0 (2) 1
	(3) 2 (4) 3
49.	Let U and V be two vector spaces over the field F. If $T_1: U \to V$ and $T_2: U \to V$ be two linear transformations, then
**	(1) $\rho(T_1 + T_2) \le \rho(T_1) + \rho(T_2)$ (2) $\rho(T_1 + T_2) \ge \rho(T_1) + \rho(T_2)$
	(3) $\rho(T_1 + T_2) \neq \rho(T_1) + \rho(T_2)$ (4) None of these
50.	If $A = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix}$ , then $A^9$ is equal to
	(1) 511 A + 510 I (2) 309 A + 105 I
	(3) 154 A + 510 I (4) None of these

Questions
The value of 'c' of the Lagrange's mean value theorem for $f(x) = x(x-1)(x-2)$ in $(0, 1/2)$ is
(1) 0.126 (2) 0.236
(3) 0.345 (4) 0.464
If $u = f(y/x)$ , then
(1) $x \frac{\partial u}{\partial x} - y \frac{\partial u}{\partial y} = 0$ (2) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$
(3) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ (4) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$
Expansion of e <sup>x</sup> cos y in powers of x and y upto first degree by Taylor series is:
(1) $1 + x$ (2) $1 + y$
(3) 1 + x + y (4) None of these
A stationary point of $f(x, y) = x^2 - xy + y^2 - 2x + y$ is:
(1) (1, 1) (2) (1, 0)
(3) (0, 1) (4) (-1, 0)
The equation of the tangent plane to the surface $z = xy$ at the point $(2, 3, 6)$ is
(1) $2x + 3y - z = 6$ (2) $3x + 2y + z = 6$
(3) $3x + 2y - z = 6$ (4) $3x + 2y - z = 3$

Question No.	Questions
56.	The partial differential equation obtained from $z = f(x^2 - y^2)$ is:
-	(1) $p + q = 0$ (2) $px + qy = 0$
	(3) $py + qx = 0$ (4) $px = qy$
57.	Complete solution of $p + q = x + y$ is:
	(1) $z = x + y - k + c$ (2) $2z = (x + k)^2 (y - k)^2 + c$
	(3) $z = k(x + y) + c$ (4) None of these
58.	General solution of $(y-z) p + (z-x) q = x-y$ is:
*	(1) $f(x+y+z, x^2+y^2+z^2)=0$ (2) $f(xy, x+y+z)=0$
	(3) $f\left(\frac{x+y}{z}, \frac{y}{z}\right) = 0$ (4) None of these
59.	The particular integral of $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$ is:
	$(1) \cos x \qquad (2) \sin x + \cos x$
	(3) $\sin x - \cos x$ (4) $-\sin x$
60.	The real characteristics of 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) $2y - 3x = c$ (2) $y + x = c_1$ , $y - 2x = c_2$ (3) $y - 2x = c$ (4) $y - x = c$
*	(3) $y - 2x = c$ (4) $y - x = c$

Question No.	Questions
61.	Let x and y be vectors in an inner product space, then
	(1) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 + \ y\ ^2$
	(2) $\ x + y\ ^2 + \ x - y\ ^2 = 2(\ x\ ^2 + \ y\ ^2)$
	(3) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 \ y\ ^2$
	(4) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 - \ y\ ^2$
62.	$\int_0^{\pi/2} \sin^6 \theta \cos^7 \theta  d\theta =$
	$(1)  \frac{32}{3003} \qquad (2)  \frac{8}{3003}$
,	$(3)  \frac{40}{3003} \qquad \qquad (4)  \frac{16}{3003}$
63.	If $u = x^2 - y^2$ , $v = 2xy$ and $x = r \cos \theta$ , $y = r \sin \theta$ , then the value of
e.	$\frac{\partial (\mathbf{u}, \mathbf{v})}{\partial (\mathbf{r}, \mathbf{\theta})}$ is
	(1) $2 r^2$ (2) $4 r^3$
	(3) $r \cos \theta$ (4) $r \sin 2\theta$
64.	$\int_0^1 \int_{x^2}^{2-x} xy  dx  dy =$
	(1) 3/8 (2) 1/3
	(3) 5/8 (4) 5/3
65.	The half-range cosine series for $f(x) = x$ , $0 \le x \le \pi$ is
	$x = \frac{\pi}{2} - \frac{4}{\pi} \sum_{n} is odd \left( \frac{\cos nx}{n^2} \right)$ , then the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} +$ is
	(1) $\frac{\pi^2}{6}$ (2) $\frac{\pi^2}{8}$
	$x = \frac{\pi}{2} - \frac{4}{\pi} \sum_{n} \text{ is odd} \left(\frac{\cos nx}{n^2}\right), \text{ then the value of } \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \dots \text{ is}$ $(1)  \frac{\pi^2}{6} \qquad \qquad (2)  \frac{\pi^2}{8}$ $(3)  \frac{\pi^2}{12} \qquad \qquad (4)  \frac{\pi}{4}$

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Question No.	Questions
66.	The analytic region of $f(z) = (x - y)^2 + 2i(x + y)$ is
	(1) $x + y = 1$ (2) $y = x$
	(3) $x-y=1$ (4) none of these
67.	The transformation $w = z + 2 - 2i$ is
a a	(1) conformal at each point
	(2) not conformal at $z = 0$
	(3) does not satisfy C – R equations
	(4) None of these
68.	The analytic function $f(z) = u + iv$ has real part $u = e^x \sin y$ is:
	(1) $e^z + c$ (2) $i e^z + c$
	(3) $-i e^z + c$ (4) $2 i e^z + c$
69.	Which of the following sets is an open set?
	(1) $A = \{\frac{1}{n} : n \in N\}$ (2) $A = \{x : 2 \le x < 3\}$
141	(3) $A = \{x : 0 \le x \le 1\}$ (4) $A = \{x : x \ne x\}$
70.	If $\{a_n\}$ converges and $\{b_n\}$ diverges, then $\{a_n + b_n\}$
	(1) converges (2) diverges
	(3) oscillates (4) none of these

Question No.	Questions		
71.	Which of the following sequences whose nth terms are given below is not a Cauchy sequence?		
	(1) $1/n$ (2) $\frac{n}{n+1}$		
	(3) $\frac{(-1)^n}{n}$ (4) $(-1)^n n$		
72.	The series $\sum (3n-1)^{-1}$ is		
	(1) convergent (2) divergent		
	(3) oscillates (4) none of these		
73.	If $\sum u_n$ converges or oscillates between finite limits and $a_1$ , $a_2$ , $a_3$ ,, is a decreasing sequence of positive terms tends to zero as a limit, then $\sum a_n u_n$ is		
	(1) convergent (2) divergent		
	(3) oscillates (4) none of these		
74.	As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called		
	(1) Gauss-Jordan method (2) Jacobi method		
	(3) Gauss-Seidal method (4) Relaxation method		
75.	For the data:		
	x 3 6 9 12		
	f(x) -1 1 2 3		
	The value of $\int_3^{12} f(x) dx$ when computed by Simpson's one-third rule is		
×	(1) 15 (2) 10		
	(3) 0 (4) 5		

Question No.	Questions
76.	The value of $\frac{\Delta^2}{E}$ (x <sup>3</sup> ) is
	(1) 6x (2) 3x
·	(3) 2x (4) 0
77.	Consider the series $x_{n+1} = \frac{x_n}{2} + \frac{9}{8x_n}$ with $x_0 = 0.5$ obtained from the Newton-
	Raphson method. The series converges to
	(1) 1.4 (2) 1.5
	(3) 1.6 (4) $\sqrt{2}$
.78.	In binomial distribution the variance $\sigma^2$ and mean $\mu$ are related by
	(1) $\sigma^2 = \mu  q$ (2) $\sigma^2 = \mu / q$ (3) $q^2  \sigma^2 = \mu$ (4) None of these
	(3) $q^2 \sigma^2 = \mu$ (4) None of these
79.	In a Poisson distribution if $2P(x=1) = P(x=2)$ , then the variance is
	(1) 0 (2) -1
	(3) 4 (4) 2
80.	Which of the following shows the correct hierarchy of arithmetic operations in C
	(1) (), **, * or /, + or – (2) (), **, *, /, +, –
	(3) (), **, /, * +, - (4) (), / or *, - or +

Question No.	Quest	ions
81.	The value of $\phi$ (462), where $\phi$ is an Eu	ıler's function, is equal to
	(1) 120 (2)	160
	(3) 32 (4)	480
82.	The value of d $(p^2 q^3) = \dots$ , when q are distinct primes.	re d(n) is divisor function of n and p,
	(1) 241 (2)	16
	(3) 12 (4)	None of these
83.	The statement "If p is a prime numb known as:	per, then $(p-1)!+1 \equiv 0 \pmod{p}$ is
	(1) Wilson's Theorem	(2) Fermat's Theorem
	(3) Chinese Remainder Theorem	(4) None of these
84.	The value of $\cosh(x + iy) =$	
	(1) $\cos x \cosh y - i \sin x \sinh y$	
	(2) $\sin x \cosh y + i \cos x \sinh y$	
	(3) $\cosh x \cos y + i \sinh x \sin y$	
	(4) $\sinh x \cos y + i \cosh x \sin y$	
85.	$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) =$	
	(1) $\frac{\pi}{3}$ (2)	$\frac{\pi}{2}$
	(3) $\frac{\pi}{4}$ (4)	None of these

Question No.	Questions		
86.	The differential equation $(y^2e^{xy^2} + 6x) dx + (2xye^{xy^2} - 4y) dy = 0$ is		
	(1) linear, homogeneous and exact		
	(2) non-linear, homogeneous and exact-		
3.	(3) non-linear, non-homogeneous and exact		
	(4) non-linear, non-homogeneous and inexact		
87.	Integrating factor of the differential equation $\frac{dx}{dy} + \left(\frac{3x}{y}\right) = \frac{1}{y^2}$ is		
	(1) $e^{y^3}$ (2) $y^3$		
· · · · · · · · · · · · · · · · · · ·	(1) $e^{y^3}$ (2) $y^3$ (3) $x^3$ (4) $-y^3$		
88.	The solution of the differential equation $y = px + p^2$ , where $p = \frac{dy}{dx}$ is		
	(1) $y = cx + c - c^2$ (2) $y = cx + c^2$		
	(3) $y = cx - e^c$ (4) $y = cx - c^2$		
89.	The orthogonal trajectory for the family of curves $r = a (1 + \sin \theta)$ is		
	(1) $r = c (1 + \cos \theta)$ (2) $r = c (1 - \cos \theta)$		
	(3) $r = c (1 - \sin \theta)$ (4) $r = c (1 + \sin \theta)$		
90.	The particular integral of differential equation $(D^2 - 4)$ y = sin 3x,		
	$D = \frac{d}{dx} \text{ is}$		
	(1) 1/4 (2) -1/13		
	(3) 1/5 (4) None of these		

Question No.	Questions
91.	If R is an Euclidean ring and a, $b \in R$ . If $b \neq 0$ is not a unit in R, then
	(1) $d(a) < d(ab)$ (2) $d(a) > d(ab)$
	(3) d (a) = d (ab) (4) None of these
92.	If integral domain I is of finite characteristic, then
	(1) I is finite only (2) I is infinite only
	(3) I is finite or infinite (4) None of these
93.	If $J_n(x)$ is the Bessel function of first kind, then $\int_0^{\pi} [J_{-2}(x) - J_2(x)] dx =$
	(1) $2$ (2) $-2$
	(3) 0 (4) 1
94.	The polynomial $2x^2 + x + 3$ in terms of Legendre polynomials is
	(1) $\frac{1}{3}(4P_2 - 3P_1 + 11P_0)$ (2) $\frac{1}{3}(4P_2 + 3P_1 - 11P_0)$
,	(3) $\frac{1}{3}(4P_2 + 3P_1 + 11P_0)$ (4) $\frac{1}{3}(4P_2 - 3P_1 - 11P_0)$
95.	L-1 (1/sn) is possible only when 'n' is
	(1) zero (2) negative integer
	(3) positive integer (4) negative rational
L	

Oivestion			_
Question No.	Que	estions	
96.	Laplace transform of t <sup>2</sup> e <sup>-3t</sup> is		$\dashv$
	$(1)  \frac{1}{(s+3)^3}$	2) $\frac{2}{(s+3)^2}$	
(a)	(1) $\frac{1}{(s+3)^3}$ (2) $\frac{3}{(s+3)^3}$	4) $\frac{2}{(s+3)^3}$	
97.	$\int_0^\infty \frac{dx}{(x^2 + 1)^2} = $ (1) $\frac{\pi}{2}$		
	$(1)  \frac{\pi}{2} \qquad (2)$	2) π/4	
		4) 0	-
98.	If $f(x) = x + 1$ , $x \in [1, 3]$ and $P = \{$ and $U(f, P)$ are respectively:	{1, 2, 3} be a partition of P, then L (f,	P)
	(1) 3, 6	2) 6, 3	
	(3) 7, 5	4) 5, 7	
99.	If f is Riemann integrable on [a,	b], then	
	(1) $\left  \int_{a}^{b} f(x) dx \right  \leq \int_{a}^{b} \left  f(x) \right  dx$ (2)	2) $\left  \int_{a}^{b} f(x) dx \right  \ge \int_{a}^{b} \left  f(x) \right  dx$	
	(3) $\left  \int_{a}^{b} f(x) dx \right  = \int_{a}^{b} \left  f(x) \right  dx$	4) None of these	
100.	$\int_a^\infty \frac{\sin x}{\sqrt{x}}  dx, \text{ where } a > 0 \text{ is :}$		
	(1) convergent (2)	(2) divergent	
	(3) oscillatory (4)	(4) proper	

CPG-EE--2019--Mathematics--Code--C

## Ofened for evaluation at 5,26 pm

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

(CPG-EE-2019) Subject: Math. 10360 Code Time: 1½ Hours Total Questions: 100 Max. Marks: 100 Roll No. \_\_\_\_\_ (in figure)\_\_\_\_ (in words) Name: \_\_\_\_\_\_ Date of Birth: \_\_\_\_\_ Father's Name: \_\_\_\_\_ Mother's Name: \_\_\_\_ Date of Examination: (Signature of the candidate)

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

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 / mis-behaviour will be registered against him / her. in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

Question Booklet along-with answer key of all the A,B,C and D code shall be got Suploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any/with regard to discrepancy in the question booklet/answer ked within 24 hours of uploading the same on the University website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case will be considered.

The candidate MUST NOT do any rough work or writing in the OMR Answer-5. 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 7. 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

Septent Sunie EXAMINATION. Jak Murand

(Signature of the Invigilator)

Question No.	Questions
1.	Let x and y be vectors in an inner product space, then
	(1) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 + \ y\ ^2$
	(2) $\ x + y\ ^2 + \ x - y\ ^2 = 2(\ x\ ^2 + \ y\ ^2)$
	(3) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 \ y\ ^2$
	(4) $\ x + y\ ^2 + \ x - y\ ^2 = \ x\ ^2 - \ y\ ^2$
2.	$\int_0^{\pi/2} \sin^6 \theta \cos^7 \theta  d\theta =$
	$(1)  \frac{32}{3003} \qquad (2)  \frac{8}{3003}$
	$(3)  \frac{40}{3003} \qquad \qquad (4)  \frac{16}{3003}$
3.	If $u = x^2 - y^2$ , $v = 2xy$ and $x = r \cos \theta$ , $y = r \sin \theta$ , then the value of
	$\frac{\partial (\mathbf{u}, \mathbf{v})}{\partial (\mathbf{r}, \mathbf{\theta})}$ is
	(1) $2 r^2$ (2) $4 r^3$
	(3) $r \cos \theta$ (4) $r \sin 2\theta$
4.	$\int_0^1 \int_{x^2}^{2-x} xy  dx  dy =$
	(1) 3/8 (2) 1/3
	(3) 5/8 (4) 5/3
5.	The half-range cosine series for $f(x) = x$ , $0 \le x \le \pi$ is
	$x=\frac{\pi}{2}-\frac{4}{\pi}\sum_{n}\text{ is odd}\bigg(\frac{\cos nx}{n^2}\bigg),\text{ then the value of }\ \frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\text{ is }$
	(1) $\frac{\pi^2}{6}$ (2) $\frac{\pi^2}{8}$ (3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$
	(3) $\frac{\pi^2}{12}$ (4) $\frac{\pi}{4}$

Question No.	Questions
6.	The analytic region of $f(z) = (x - y)^2 + 2i(x + y)$ is
	(1) $x + y = 1$ (2) $y = x$
7	(3) $x-y=1$ (4) none of these
7.	The transformation $w = z + 2 - 2i$ is
	(1) conformal at each point
	(2) not conformal at $z = 0$
	(3) does not satisfy C – R equations
	(4) None of these
8.	The analytic function $f(z) = u + iv$ has real part, $u = e^x \sin y$ is:
	(1) $e^z + c$ (2) $i e^z + c$
	(3) $-i e^z + c$ (4) $2 i e^z + c$
9.	Which of the following sets is an open set?
	(1) $A = \{\frac{1}{n} : n \in \mathbb{N}\}$ (2) $A = \{x : 2 \le x < 3\}$
	(3) $A = \{x : 0 \le x \le 1\}$ (4) $A = \{x : x \ne x\}$
10.	If $\{a_n\}$ converges and $\{b_n\}$ diverges, then $\{a_n + b_n\}$
	(1) converges (2) diverges
	(3) oscillates (4) none of these

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Question No.	Questions
11.	If R is an Euclidean ring and a, $b \in R$ . If $b \neq 0$ is not a unit in R, then
	(1) $d(a) < d(ab)$ (2) $d(a) > d(ab)$
	(3) $d(a) = d(ab)$ (4) None of these
12.	If integral domain I is of finite characteristic, then
	(1) I is finite only (2) I is infinite only
	(3) I is finite or infinite (4) None of these
13.	If $J_n(x)$ is the Bessel function of first kind, then $\int_0^{\pi} [J_{-2}(x) - J_2(x)] dx =$
	(1) 2 (2) -2
	(3) 0 (4) 1
14.	The polynomial $2x^2 + x + 3$ in terms of Legendre polynomials is
	(1) $\frac{1}{3}(4P_2 - 3P_1 + 11P_0)$ (2) $\frac{1}{3}(4P_2 + 3P_1 - 11P_0)$
	(3) $\frac{1}{3}(4P_2 + 3P_1 + 11P_0)$ (4) $\frac{1}{3}(4P_2 - 3P_1 - 11P_0)$
15.	L-1 (1/sn) is possible only when 'n' is
	(1) zero (2) negative integer
	(3) positive integer (4) negative rational

Question No.	Questions
16.	Laplace transform of t <sup>2</sup> e <sup>-3t</sup> is
	(1) $\frac{1}{(s+3)^3}$ (2) $\frac{2}{(s+3)^2}$
	(3) $\frac{3}{(s+3)^3}$ (4) $\frac{2}{(s+3)^3}$
17.	$\int_0^\infty \frac{\mathrm{dx}}{(\mathrm{x}^2+1)^2} =$
to.	(1) $\frac{\pi}{2}$ (2) $\pi/4$
-	(3) 1 (4) 0
18.	If $f(x) = x + 1$ , $x \in [1, 3]$ and $P = \{1, 2, 3\}$ be a partition of P, then L (f, P) and U (f, P) are respectively:
	(1) 3, 6 (2) 6, 3
	(3) 7, 5 (4) 5, 7
19.	If f is Riemann integrable on [a, b], then
1	$(1)   \int_a^b f(x) dx   \le \int_a^b  f(x)  dx \qquad (2)   \int_a^b f(x) dx   \ge \int_a^b  f(x)  dx$
	(3) $\left  \int_{a}^{b} f(x) dx \right  = \int_{a}^{b} \left  f(x) \right  dx$ (4) None of these
20.	$\int_a^\infty \frac{\sin x}{\sqrt{x}} dx, \text{ where } a > 0 \text{ is :}$
	(1) convergent (2) divergent
	(3) oscillatory (4) proper

CPG-EE--2019--Mathematics--Code--D

Question No.	Questions
21.	The value of 'c' of the Lagrange's mean value theorem for $f(x) = x(x-1)(x-2)$ in $(0, 1/2)$ is
	(1) 0.126 (2) 0.236
	(3) 0.345 (4) 0.464
22.	If $u = f(y/x)$ , then
	(1) $x \frac{\partial u}{\partial x} - y \frac{\partial u}{\partial y} = 0$ (2) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 0$
	(3) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ (4) $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 1$
23.	Expansion of $e^x$ cos y in powers of x and y upto first degree by Taylor series is:
	(1) $1 + x$ (2) $1 + y$
	(3) 1 + x + y (4) None of these
24.	A stationary point of $f(x, y) = x^2 - xy + y^2 - 2x + y$ is:
	(1) (1, 1) (2) (1, 0)
a	(3) (0, 1) (4) (-1, 0)
25.	The equation of the tangent plane to the surface $z = xy$ at the point $(2, 3, 6)$ is
	(1) $2x + 3y - z = 6$ (2) $3x + 2y + z = 6$
	(3) $3x + 2y - z = 6$ (4) $3x + 2y - z = 3$

Question No.	Questions
26.	The partial differential equation obtained from $z = f(x^2 - y^2)$ is:
	(1) $p + q = 0$ (2) $px + qy = 0$
	(3) $py + qx = 0$ (4) $px = qy$
27.	Complete solution of $p + q = x + y$ is:
	(1) $z = x + y - k + c$ (2) $2z = (x + k)^2 (y - k)^2 + c$
	(3) $z = k (x + y) + c$ (4) None of these
28.	General solution of $(y-z) p + (z-x) q = x-y$ is:
	(1) $f(x+y+z, x^2+y^2+z^2)=0$ (2) $f(xy, x+y+z)=0$
	(3) $f\left(\frac{x+y}{z}, \frac{y}{z}\right) = 0$ (4) None of these
29.	The particular integral of $\frac{\partial^2 z}{\partial x^2} - 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin x$ is:
	$(1) \cos x \qquad (2) \sin x + \cos x$
	(3) $\sin x - \cos x$ (4) $-\sin x$
30.	The real characteristics of the partial differential equation
	$\frac{\partial^2 z}{\partial x^2} + 4 \frac{\partial^2 z}{\partial x \partial y} + 4 \frac{\partial^2 z}{\partial y^2} = 0 \text{ is}$
9	(1) $2y - 3x = c$ (2) $y + x = c_1$ , $y - 2x = c_2$ (3) $y - 2x = c$ (4) $y - x = c$
	(3) $y - 2x = c$ (4) $y - x = c$

Question No.	Questions
31.	The value of $\phi$ (462), where $\phi$ is an Euler's function, is equal to
	(1) 120 (2) 160
	(3) 32 (4) 480
32.	The value of d $(p^2 q^3) = \dots$ , where d(n) is divisor function of n and p, q are distinct primes.
	(1) 241 (2) 16
	(3) 12 (4) None of these
33.	The statement "If p is a prime number, then $(p-1)!+1 \equiv 0 \pmod{p}$ " is known as:
	(1) Wilson's Theorem (2) Fermat's Theorem
	(3) Chinese Remainder Theorem (4) None of these
34.	The value of $\cosh(x + iy) =$
	(1) $\cos x \cosh y - i \sin x \sinh y$
	(2) $\sin x \cosh y + i \cos x \sinh y$
	(3) $\cosh x \cos y + i \sinh x \sin y$
	(4) $\sinh x \cos y + i \cosh x \sin y$
35.	$\tan^{-1}\left(\frac{1}{2}\right) + \tan^{-1}\left(\frac{1}{3}\right) =$
	(1) $\frac{\pi}{3}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{4}$ (4) None of these
	(3) $\frac{\pi}{4}$ (4) None of these

 $CPG\!\!-\!\!EE\!\!-\!\!2019\!\!-\!\!Mathematics\!\!-\!\!Code\!\!-\!\!D$ 

Question No.	Questions	
36.	The differential equation $(y^2e^{xy^2} + 6x) dx + (2xye^{xy^2} - 4y) dy = 0$ is	
	(1) linear, homogeneous and exact	
	(2) non-linear, homogeneous and exact-	
	(3) non-linear, non-homogeneous and exact	
	(4) non-linear, non-homogeneous and inexact	
37.	Integrating factor of the differential equation $\frac{dx}{dy} + \left(\frac{3x}{y}\right) = \frac{1}{y^2}$ is	
	(1) $e^{y^3}$ (2) $y^3$	
	(1) $e^{y}$ (2) $y^{3}$ (3) $x^{3}$ (4) $-y^{3}$	
38.	The solution of the differential equation $y = px + p^2$ , where $p = \frac{dy}{dx}$ is	
	(1) $y = cx + c - c^2$ (2) $y = cx + c^2$	
	(3) $y = cx - e^c$ (4) $y = cx - c^2$	
39.	The orthogonal trajectory for the family of curves $r = a (1 + \sin \theta)$ is	
i i	(1) $r = c (1 + \cos \theta)$ (2) $r = c (1 - \cos \theta)$	
	(3) $r = c (1 - \sin \theta)$ (4) $r = c (1 + \sin \theta)$	
40.	The particular integral of differential equation $(D^2 - 4)$ y = sin 3x,	
	$D = \frac{d}{dx} \text{ is}$	
	(1) 1/4 (2) -1/13	
	(3) 1/5 (4) None of these	

 $CPG\!\!-\!\!EE\!\!-\!\!2019\!\!-\!\!Mathematics\!\!-\!\!Code\!\!-\!\!D$ 

Question No.			Ques	cions
41.	Function declaration statement identifies a function with its			
	(1)	name	(2)	arguments
	(3)	data type of return value	(4)	all of these
42.	Whi	ich is invalid C constant?		
	(1)	0.5	(2)	<b>'1052'</b>
	(3)	0515	(4)	'a'
43.	Wh	at will be the output of the f	ollow	ing program
	mai	in()		
.	{			
		Int i=4, z=12;		
		If (i=5 && z>5)		
	U.	printf("\nLet us C");		
	else			y
		printf('\nWish C was free!	");	
	}			,
	(1)	Let us C	<b>(2)</b>	Wish C was free!
	(3)	Error in the program	(4)	None of these
44.	An array is a collection of			
	(1)	different data types scatte	ered t	throughout memory
	(2)	the same data type scatte	red t	hroughout the memory
	(3)	the same data type placed	nex	to each other in memory
	(4)	different data type placed	next	to each other in memory
45.	What will be the tangential acceleration at $t = 3$ when the particle moves along the curve $x = 4t$ , $y = 6t - t^2$ ?		tion at $t = 3$ when the particle moves	
	(1)	0	(2)	2 unit/sec <sup>2</sup>
	(3)	- 2 unit/sec²	(4)	None of these

Question No.	Questions		
46.	The acceleration of a particle, moving with S.H.M. is 44 m/sec <sup>2</sup> when its distance from the mean position is 1/4 m. The time of an oscillation is:		
	(1) $\pi$ sec (2) $\pi/2$ sec		
	(3) $\pi/4$ sec (4) None of these		
47.	A body of mass 50 kg is acted upon by a force of 5 N. How long will it take to attain a velocity of 30 m/sec.		
	(1) 5 min (2) 3 min		
	(3) 10 min (4) 6 min		
48.	The work done in stretching an elastic string of natural length $\ell_0$ and of modulus of elasticity $\lambda$ to a length $\ell$ is :		
	(1) $\frac{\lambda \ell}{\ell_0}$ (2) $\frac{\lambda (\ell - \ell_0)^2}{2 \ell_0}$ (3) $\frac{\lambda (\ell + \ell_0)^2}{2 \ell_0}$ (4) $\frac{\lambda \ell_0}{2 \ell}$		
49.	If the time of flight of a bullet over a horizontal range R is T seconds, then the inclination of the direction of projection to the horizontal is:		
	$(1)   \tan^{-1}\left(\frac{T^2}{2R}\right)   (2)   \tan^{-1}\left(\frac{T^2}{2gR}\right)$		
	(3) $\tan^{-1}\left(\frac{T^2 g}{2R}\right)$ (4) $\tan^{-1}\left(\frac{T^2 g}{R}\right)$		
50.	If a particle describes the equiangular spiral $r = a e^{\theta \cot \alpha}$ under a force F to the pole, then the law of force is :		
	(1) $F \propto r$ (2) $F \propto \frac{1}{r^2}$		
,	(3) $F \propto \frac{1}{r^3}$ (4) $F \propto \frac{1}{r^5}$		

Question No.	Questions		
51.	Thich of the following statements is not correct?		
	1) The real line is a complete metric space		
	(2) The complex plane with the usual metric is complete.		
	(3) The space of continuous functions on [a, b] is complete.		
	(4) The space of rational numbers with the usual metric is complete.		
52.	Let A and B be any two sets of a metric space. Then		
	(1) $(A \cap B)^{\circ} = A^{\circ} \cap B^{\circ}$ (2) $(A \cup B)^{\circ} = A^{\circ} \cup B^{\circ}$		
	(3) $\overline{A \cap B} = \overline{A} \cap \overline{B}$ (4) $(A \cap B)' = A' \cap B'$		
53.	Any totally bounded metric space is		
9	(1) separable (2) not bounded		
	(3) not complete (4) not separable		
54.	Every convergent sequence is:		
	(1) bounded and Cauchy (2) bounded but not Cauchy		
	(3) not bounded but Cauchy (4) none of the above		
55.	Which of the following sets of Vectors in R <sup>3</sup> (R) is linearly independent over R		
	(1) $\{(1, -2, 1), (2, 1, -1), (7, -4, 1)\}$		
	(2) {(1, 1, 1), (0, 4, 1), (3, 0, 1)}		
	$(3)  \{(2, 3, 1), (-1, 4, -2), (1, 18, -4)\}$		
	$(4)  \{(0, 2, -4), (1, -2, -1), (1, -4, 3)\}$		
	<u> </u>		

CPG-EE--2019--Mathematics--Code--D

Questions
Let $W_1$ and $W_2$ be finite dimensional subspaces of a vector space V. If $\dim W_1 = 2$ , $\dim W_2 = 2$ , $\dim (W_1 + W_2) = 3$ , then $\dim (W_1 \cup W_2)$ is
(1) 1 (2) 2
(3) 3 (4) 4
If x, y, z are in AP with common difference 'd' and the rank of the matrix
$\begin{bmatrix} 4 & 5 & x \\ 5 & 6 & y \\ 6 & k & z \end{bmatrix}$ is 2, then the value of 'd' and 'k' are
(1) $d = x/2$ ; k is arbitrary (2) d an arbitrary number; $k = 7$
(3) $d = k$ ; $k = 5$ (4) $d = x/2$ ; $k = 6$
Let $T: \mathbb{R}^2 \to \mathbb{R}^3$ be a linear transformation given by $T(x_1, x_2) = (x_1 + x_2, x_1 - x_2, x_2)$ then, rank T is
(1) 0 (2) 1
(3) 2 (4) 3
Let U and V be two vector spaces over the field F. If $T_1: U \to V$ and $T_2: U \to V$ be two linear transformations, then
(1) $\rho(T_1 + T_2) \le \rho(T_1) + \rho(T_2)$ (2) $\rho(T_1 + T_2) \ge \rho(T_1) + \rho(T_2)$
(3) $\rho (T_1 + T_2) \neq \rho (T_1) + \rho (T_2)$ (4) None of these
If $A = \begin{bmatrix} -3 & 2 \\ -1 & 0 \end{bmatrix}$ , then $A^9$ is equal to
(1) 511 A + 510 I (2) 309 A + 105 I
(3) 154 A + 510 I (4) None of these

Question No.	Questions
61.	Which of the following sequences whose nth terms are given below is not a Cauchy sequence?
• 1/2	(1) $1/n$ (2) $\frac{n}{n+1}$
	(3) $\frac{(-1)^n}{n}$ (4) $(-1)^n n$
62.	The series $\sum (3n-1)^{-1}$ is
	(1) convergent (2) divergent
	(3) oscillates (4) none of these
63.	If $\sum u_n$ converges or oscillates between finite limits and $a_1$ , $a_2$ , $a_3$ ,, is a decreasing sequence of positive terms tends to zero as a limit, then $\sum a_n u_n$ is
	(1) convergent (2) divergent
	(3) oscillates (4) none of these
64.	As soon as a new value of a variable is found by iteration, it is used immediately in the following equations, this method is called
	(1) Gauss-Jordan method (2) Jacobi method
	(3) Gauss-Seidal method (4) Relaxation method
65.	For the data:
	x     3     6     9     12       f(x)     -1     1     2     3
	The value of $\int_3^{12} f(x) dx$ when computed by Simpson's one-third rule is
	(1) 15 (2) 10
	(3) 0 (4) 5

Question No.	Questions
66.	The value of $\frac{\Delta^2}{E}$ (x <sup>3</sup> ) is
	(1) 6x (2) 3x
	(3) 2x (4) 0
67.	Consider the series $x_{n+1} = \frac{x_n}{2} + \frac{9}{8x_n}$ with $x_0 = 0.5$ obtained from the Newton-
	Raphson method. The series converges to
	(1) 1.4 (2) 1.5
	(3) 1.6 (4) $\sqrt{2}$
68.	In binomial distribution the variance $\sigma^2$ and mean $\mu$ are related by
	(1) $\sigma^2 = \mu  q$ (2) $\sigma^2 = \mu / q$
	(1) $\sigma^2 = \mu  q$ (2) $\sigma^2 = \mu / q$ (3) $q^2  \sigma^2 = \mu$ (4) None of these
69.	In a Poisson distribution if $2P(x = 1) = P(x = 2)$ , then the variance is
	(1) 0 (2) -1
	(3) 4 (4) 2
70.	Which of the following shows the correct hierarchy of arithmetic operations in C
	(1) (), **, * or /, + or – (2) (), **, *, /, +, –
	(3) (), **, /, * +, - (4) (), / or *, - or +

Question No.	Questions		
71.	What is the angle between two equal forces P and P, when the square of		
	their resultant is equal to $(2-\sqrt{3})$ times their product?		
	(1) 130° (2) 140°		
*	(3) 145° (4) 150°		
72.	What is the resolved part of a force equal to 60 kg wt. in a direction making an angle equal to tan <sup>-1</sup> 3/4 with its direction?		
	(1) 48 kg wt. (2) 40 kg wt.		
	(3) 52 kg wt. (4) None of these		
73.	Forces forming a couple are each 4 N and its arm is 1 m. What will be the arm of an equivalent couple each of whose force is 3N?		
	(1) 1 m (2) 4/3 m		
	(3) 3/4 m (4) None of these		
74.	At what point of a tree must one end of a rope of given length '\ell' be attached so that a man pulling at the other end with a given force may have the greatest tendency to pull it over?		
197	(1) $\frac{\ell}{2}$ (2) $\frac{\sqrt{\ell}}{2}$ (3) $\frac{\ell}{\sqrt{2}}$ (4) $\ell$		
	$(3)  \sqrt[\ell]{\sqrt{2}} \qquad \qquad (4)  \ell$		
75.	Six equal rods AB, BC, CD, DE EF and FA are each of weight W and are freely joined so as to form a hexagon. The rod AB is fixed in a horizontal position and the middle point of AB and DE are joined by a string. The tension in the string is:		
8	(1) $3W$ (2) $\sqrt[W]{\sqrt{3}}$ (3) $3\sqrt{3}W$ (4) $\sqrt{3}W/2$		
E .	(3) $3\sqrt{3}$ W (4) $\sqrt{3}$ W/2		

Question No.	Questions		
76.	If (G, •) is a group and a, b are any element of G, then		
	(1) order of 'ab' is less than order of 'ba'		
	(2) order of 'ab' is equal to order of 'ba'		
	(3) order of 'ab' is greater than order of 'ba'		
	(4) none of these		
77.	If H and K are two subgroups of a group G, then HK is a subgroup of G iff		
	(1) $HK = 1$ (2) $HK = H^{-1}K^{-1}$		
-	(3) HK = KH (4) None of these		
78.	How many generators are there of the cyclic group of order 10?		
3	(1) 2 (2) 4		
	(3) 5 (4) 6		
79.	The identity permutation is		
	(1) even permutation (2) odd permutation		
	(3) neither even nor odd (4) none of these		
80.	If I is a ideal in ring R, then		
	(1) R/I is a ring (2) RI is a ring		
	(3) R + I is a ring (4) None of these		

Question No.	G	uestions	
81.	The value of $\hat{i} \times (\hat{j} \times \hat{k})$ is equal to		
	(1) -1	(2) 1	
	(3) 0	(4) ± 1	
82.	The value of curl (grad f), where	$e f = 2x^2 - 3y^2 + 4z^2 is$	
	(1) $4x - 6y + 8z$	(2) $4x \hat{i} - 6y \hat{j} + 8z \hat{k}$	
	(3) 3	(4) 0	
83.	The value of $\int \operatorname{grad}(x+y-z) d\vec{r} d\vec{r}$	rom (0, 1, -1) to (1, 2, 0) is	
	(1) 0	(2) 3	
	(3) -1	(4) not obtainable	
84.	The magnitude of the vector drawn perpendicular to the surface $x^2 + 2y^2 + z^2 = 7$ at the point $(1, -1, 2)$ is		
	(1) 2/3	(2) 3/2	
	(3) 3	(4) 6	
85.	The value of $\lambda$ so that the vesclenoidal vector is	ctor $(x+3y)\hat{i} + (y-2z)\hat{j} + (x+\lambda z)\hat{k}$ is a	
, j	(1) -2	(2) 3	
	(3) 1	(4) None of these	

Question No.	Questions			
86.	What conic does the equation $6x^2 - 5xy - 6y^2 + 14x + 5y + 4 = 0$ represent?			
	(1) an ellipse (2) circle			
	(3) pair of straight lines (4) hyperbola			
87.	Section of a sphere by a plane is			
	(1) parabola (2) ellipse			
	(3) circle (4) none of these			
88.	The equation $2(x^2 + y^2 + z^2) - 2xy + 2yz + 2zx = 3a^2$ represents a			
	(1) cone (2) right-circular cylinder			
	(3) sphere (4) pair of planes			
89.	The radius of the great circle of a sphere is			
	(1) greater than the radius of the sphere			
	(2) less than the radius of the sphere			
	(3) equal to the radius of the sphere			
	(4) none of these			
90.	The nature of the section of the central conicoid $ax^2 + by^2 + cz^2 = 1$ by the plane $\ell x + my + nz = p$ is a hyperbola if:			
	(1) $bc\ell^2 + cam^2 + abn^2 < 0$ (2) $ba\ell^2 + cbm^2 + acn^2 < 0$			
	(3) $bcm^2 + can^2 + ab\ell^2 < 0$ (4) $bc\ell^2 + cam^2 + abn^2 > 0$			

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Question No.	Questions		
91.	If $A^2 - A + I = 0$ , then the inverse of A is		
	(1) A-I (2) A+I		
	(3) A (4) I – A		
92.	If A and B are invertible matrices of the same order, such that AI then A and B are	B = BA	
	(1) Similar (2) dissimilar		
	(3) have different eigen values (4) none of these		
93.	The nature of quadratic form 2xy + 2yz + 2zx is		
	(1) Indefinite (2) Definite		
7	(3) Positive definite (4) Negative definite		
94.	For what real value of 'k' the following equations have not solution:	n-zero	
	x + 2y + 3z = kx, $3x + y + 2z = ky$ , $2x + 3y + z = kz$		
	(1) -3 (2) 4		
	(3) 5 (4) 6		
95.	If $\alpha$ , $\beta$ , $\gamma$ are the roots of the equation $x^3 + 3x - 3 = 0$ , then the va $\alpha^{-1} + \beta^{-1} + \gamma^{-1}$ is:	alue of	
	(1) $\frac{3}{4}$ (2) 0		
	(3) $\frac{4}{3}$ (4) $\frac{1}{4}$		

Question No.	Questions
96.	The vertical and horizontal asymptotes of $y = \frac{x}{x-2}$ are
	(1) $x = 2, y = 1$ (2) $x = 2, y = -1$
	(3) $x = -2, y = -1$ (4) $x = 2, y = 2$
97.	The radius of curvature at the origin for the curve $x^3 + y^3 = 3axy$ is equal to
	(1) 2a (2) 2a/3
•	(3) 1 (4) 3a/2
98.	The point of inflexion of the curve $y^2 = x (x + 1)^2$ is
	(1) $\left(\frac{1}{3}, \frac{4}{3\sqrt{3}}\right)$ (2) $\left(\frac{2}{3}, -\frac{4}{3\sqrt{3}}\right)$
	(3) $\left(\frac{2}{3}, \left(\frac{5\sqrt{2}}{3\sqrt{3}}\right)\right)$ (4) None of these
99.	The area bounded by the curve $x^2 = 4y$ and the straight line $x = 4y - 2$ is equal to
	(1) 5/8 (2) 9/8
·e'	(3) 1/3 (4) 8/3
100.	The volume of the solid generated by the revolution of $r=2a\cos\theta$ about the initial line is equal to :
	(1) $\frac{2\pi a^3}{3}$ (2) $\frac{4\pi a^3}{3}$
	(3) $\frac{8\pi a^3}{3}$ (4) None of these

Question No.	А	В	С	D
1	D	A	D	B :
2	А	С	A	D
3	А	A	В	В.
4	D	С	C	A
5	С	С	A	В
6	A	С	В	С
7	D	В .	С	Α,
8	A	В	В	C.
9	В	С	A	D,
10	В	D	A	1
11/	A	D	C	B,
12	C	В	D	C,-
13	A	A	В	C.
14	C	C	D	C.
15	C	A	A	
16	. C	В	C	C.
17	В	A	C	D.
18	В	В	В	B .
19	С	С	С	A
20	D	C	A	
21/	C	В	D	A / B -
12	D	D	A	В -
23	В	В	A	
24	D	A	D	Α.
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.6	C	С	A	C.
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8	В	C	A	B-
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3	С	В	A	A/
1	C	D	В	A/
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	D	C	C	Α,
	В	С	В	B.
3	D	В	A	C.
9	A	С	D	A.
)	A	A	С	Α,
	D	D	В	D,
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3	A	. А	D	В,
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	A	С	Α	C.
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	С	В	С	A.
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	D	А	В	А
	В	А	А	B <sup>.</sup>
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	С	C	А	В
	D	А	С	A
	В	А	D	A
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	В	А	С	D
	А	А	А	B-
	С	D	С	D
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	В	D	В	C
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