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PG-EE-2016

SUBJECT: Mathematics Hons. Five Year

A		Sr. No. 10101
Time : 11/4 Hours	Max. Marks : 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Father's Name	
Mother's Name	Date of Examination	
(Signature of the Candidate)		(Signature of the Invigilator)

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

- 1. All questions are compulsory.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark.
 Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

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1.	If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ are :						
	(1) 99 ²	(2) 18	(3) 2 ⁹⁹	(4) 100			
2.	If $f(x) = 1 - \frac{1}{x}$, t	hen the value of f	$f\left(\frac{1}{x}\right)$] is:				
	(1) $\frac{1}{x} - 1$	$(2) \frac{x}{1-x}$	$(3) \ \frac{x-1}{x}$	$(4) \frac{x}{x-1}$			
3.	The function $f($	$x) = \log\left(x + \sqrt{x^2 + 1}\right)$)is:				
	(1) an even fun (3) a periodic fu		(2) an odd fund (4) none of the				
4.	The value of sin	$A \sin(60^\circ + A) \sin($	$60^{\circ} - A$) is equal to :				
	(1) sin 3A	$(2) \sin \frac{3A}{2}$	$(3) \sin \frac{3A}{4}$	$(4) \sin\frac{4A}{3}$			
5.	If $\cos \theta = \frac{1}{2} \left(x + \frac{1}{2} \right)$	$(\frac{1}{x})$, then $(\frac{1}{2})(x^2 + \frac{1}{x^2})$) is equal to :				
	(1) cos 20	(2) sin 20	(3) sec 2θ	(4) tan 20			
6.	If $y = \sin^2 \theta + \cos^2 \theta$	$\sec^2\theta$, $\theta \neq 0$, then:					
	(1) $y > 2$	(2) $y \le 2$	(3) $y \ge -2$	(4) $y = 0$			
7.	The value of $\frac{\cos}{\cos}$	$\frac{\sin 12^{\circ} - \sin 12^{\circ}}{\sin 12^{\circ} + \sin 12^{\circ}} + \frac{\sin 12^{\circ}}{\cos 12^{\circ}}$	47° is equal to :				
	(1) 0	(2) -1	(3) 1	(4) None of these			
8.		$\dots \dots + (2n-1) = n$	2 is:				
	(1) true for $n > 1$ (3) true for all n		(2) true for no n(4) none of thes				
9.	If eleven memb Cashier always s	ers of a committee it together, then the	sit at a round table number of arrangen	le so that the President and nents is :			
	(1) <u>[10</u> × 2	(2) <u>19</u> × 2	(3) 110	(4) None of these			
),	In how many wa	ys can 5 keys be pu	t in a ring?				
	(1) [5	(2) [5]	(3) 4	(4) 4			

together, is:

(1) 128 w

(1) 3

(1) 164

	Y-7	. 2	-0 are complex W	here p, q are real; then the
14.	If the roots of the equation	$\int_{0}^{\infty} x^{2} - 4qx + p^{2} = 0$	re:	here p, q are real; then the
	(1) real and equal (3) real and unequa		(2) imaginary (4) none of these	
15.	If $a + b = 8$, then ab i (1) $a = 3$, $b = 5$	(2) $a = 4, b = 4$	(3) $a = 6, b = 2$	(4) None of these
16.	If the coefficient of	7th and 13th term	in the expansion of	$(1+x)^n$ are equal, then n is
	equal to: (1) 10	(2) 20	(3) 15	(4) 18
17.	If $^{n}c_{-}$ denotes the		nations of n things	taken r at a time, then the
	expression $n_{c_{\tau+1}}$ +	$n_{c_{r-1}+2 \times n_{c_r}}$ equal	s:	
	(1) $^{n+2}c_r$	(2) $^{n+2}c_{r+1}$	(3) $^{n+1}c_r$	(4) $^{n+1}c_{r+1}$
18	. The number which numbers may be in	n should be added i.G. P. is:	to the numbers 2,	14, 62, so that the resulting
	(1) 4	(2) 3	(3) 2	(4) 1
19	If the roots of the difference is:	equation $x^3 - 12x^2$	$x^2 + 39x - 28 = 0$ are i	n A. P., then their common
	(1) ±2	(2) ±4	(3) ±1	(4) ±3
20	. The equation of	the straight line jo	ining the origin to	the point of intersection o
	y - x + 7 = 0 and y (1) $3x + 4y = 0$	(2) $4x + 3y = 0$	(3) $3x - 4y = 0$	$(4) \ 4x - 3y = 0$
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11. A lady gives a dinner party for six guests. The number of ways in which they may be

(2) 140

(2) 4

(2) -128 w

12. If w is an imaginary cube root of unity, then $(1+w-w^2)$ is equal to:

13. The equation $z\overline{z} + (2-3i)z + (2+3i)\overline{z} + 4 = 0$ represents a circle of radius :

selected from among ten friends, if two of the friends will not attend the party

(3) 112

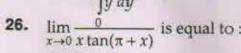
(3) 2

(3) $-128w^2$

(4) 40

 $(4) 128 w^2$

21.		whose sum of the ercepts, passes throu		exes is equal to half of	the
	(1) (2, 2)	(2) (1, 1)	(3) (4, 4)	(4) (3,3)	
22.	$(1) x^2 + y^2 + 2x - 2$		(2) and tangent $x + y$ (2) $x^2 + y^2 - 2x - y$ (4) $x^2 + y^2 - 2x - y$	-4y + 3 = 0	
23.	The distance between major axis of the (1) 8		ellipse is 16 and the	eccentricity is $\frac{1}{2}$. Length	n of
24.	And the second			(4) 64 divided by the yz-plane i (4) -2:3	is:
25.	to y-axis, then its	equation is:	pectively on z-axis ar $(3) 3x + 4z = 12$	and x -axis. If plane is para	illel
26.	$\lim_{x \to 0} \frac{\int_{0}^{x} y dy}{\int_{0}^{x} \int_{0}^{x} y dy}$ is		(3) 3x + 4z = 12	(4) 32 + 4y = 12	



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

27. The points of discontinuity of
$$\tan x$$
 are:

- (1) $x = n\pi$
- (2) 2mm
- (3) $(2n+1)\frac{\pi}{2}$ (4) $-2n\pi$

where $n \in I$

28. If
$$xy = e^{x-y}$$
, then $\frac{dy}{dx}$ is equal to:

- (1) $\frac{(x-1)y}{x(1+y)}$ (2) $\frac{(x+1)y}{x(1+y)}$ (3) $\frac{(x-1)y}{x(1-y)}$
- (4) None of these

29. If
$$y = \frac{1 + \sin x - \cos x}{1 + \sin x + \cos x}$$
, then $\frac{dy}{dx}$ is equal to:

- (1) $\frac{1}{\cos x}$ (2) $\frac{1}{\sin x}$ (3) $\frac{1}{1-\cos x}$
- (4) None of these

- **30.** If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then A^{100} is equal to:
 - (1) 2¹⁰⁰ A (2) 100 A
- (3) 299 A
- (4) 299 A

- **31.** If A is a square matrix, then (A + A') is:
 - (1) unit matrix

- (2) symmetric matrix
- (3) non-singular matrix
- (4) skew-symmetric matrix
- **32.** If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$ is:

- (3) 4 (4) no real value
- 33. If $A = \begin{bmatrix} 0 & 3 \\ 2 & 0 \end{bmatrix}$ and $A^{-1} = \lambda(\text{adj } A)$, then λ is equal to:
 - (1) $-\frac{1}{6}$ (2) $\frac{1}{6}$ (3) $\frac{1}{3}$ (4) $-\frac{1}{3}$

- **34.** If A is a square matrix such that AA' = I = A'A, then |A| is equal to:
 - (1) 0
- $(3) \pm 1$
- (4) None of these
- $1 w w^2/2$ **35.** If w is a complex cube root of unity, then $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is equal to:
 - (1) 1
- (2) w
- (3) 0 (4) w^2
- **36.** If $C = 2 \cos \theta$, then the value of the determinant $\Delta = \begin{bmatrix} 1 & C & 1 \end{bmatrix}$ is:
 - (1) $\frac{\sin 4\theta}{\sin \theta}$

(2) $4\cos^2\theta(2\cos\theta - 1)$

(3) $\frac{2\sin^2 2\theta}{\sin \theta}$

- (4) None of these
- 37. x + ky z = 0, 3x ky z = 0 and x 3y + z = 0 has non-zero solution for k is equal to :
 - (1) 0
- (2) 1
- (3) -1
- (4) None of these

38. If
$$A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$$
, then A^{-1} is equal to:

(1)
$$\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$$

(2)
$$\begin{bmatrix} -\frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & \frac{1}{11} \end{bmatrix}$$

(1)
$$\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$$
 (2) $\begin{bmatrix} -\frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & \frac{1}{11} \end{bmatrix}$ (3) $\begin{bmatrix} \frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (4) None of these

39. If
$$A = \begin{bmatrix} 1 & \log_b^a \\ \log_a^b & 1 \end{bmatrix}$$
, then $|A|$ is equal to :

- (1) 0
- (2) 1
- (3) \log_b^a (4) \log_a^b

40. If
$$y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots + \infty}}}$$
, then $\frac{dy}{dx}$ is equal to:

(1)
$$-\frac{\cos x}{2y-1}$$
 (2) $\frac{\sin x}{1-2y}$ (3) $\frac{\cos x}{2y-1}$

$$(2) \quad \frac{\sin x}{1 - 2y}$$

$$(3) \quad \frac{\cos x}{2y - 1}$$

(4) None of these

41. If
$$f(x) = x + 2$$
, then $f'[f(x)]$ at $x = 4$ is:

- (1) 8
- (3) 4
- (4) 5

42. The value of
$$\frac{d}{dx} \left[\left(\frac{\tan^2 2x - \tan^2 x}{1 - \tan^2 2x \tan^2 x} \right) \cot 3x \right]$$
is:

- (1) sec x
- (2) $sec^3 x$
- (3) $\sec x \tan x$ (4) $\sec^2 x$

43. If
$$x = a \sin \theta$$
, $y = b \cos \theta$, then $\frac{d^2y}{dx^2}$ is equal to:

(1)
$$\frac{b}{a^2}\sec\theta$$

(1)
$$\frac{b}{a^2}\sec\theta$$
 (2) $-\frac{b}{a^2}\sec^3\theta$ (3) $\frac{b}{a}\sec^2\theta$

(3)
$$\frac{b}{a} \sec^2 \theta$$

(4) None of these

44. If
$$x^m y^n = (x + y)^{m+n}$$
, then $\frac{dy}{dx}$ is:

- $(1) \quad \frac{y}{y} \qquad \qquad (2) \quad \frac{x}{y}$
- (3) xy

(4) None of these

45. Maximum slope of the curve
$$y = -x^3 + 3x^2 + 9x - 27$$
 is:

- (2) 16
- (4) 32

46. The function
$$x^x$$
 is increasing, when:

- (1) $x > \frac{1}{x}$
- (2) $x < \frac{1}{x}$
- (3) x < 0
- (4) None of these

- 47. The rate of change of the surface area of a sphere of radius r, when the radius is increasing at the rate of 2 cm/s is proportional to:
- (2) r^2
- $(4) \frac{1}{2}$
- **48.** Angle between the tangents to the curve $y = x^2 5x + 6$ at the points (2, 0) and (3, 0) is:
 - (1) $\frac{\pi}{2}$
- (2) $\frac{\pi}{2}$
- (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$

- **49.** $\int \frac{(x+1)^2}{x(x^2+1)} dx$ is equal to:
- (1) $\log x + C$ (2) $2 \tan^{-1} x + C$ (3) $\log \frac{1}{1 + x^2} + C$ (4) None of these

- **50.** $\int_{1+\cos x}^{x+\sin x} dx$ is equal to:

- (1) $x \tan \frac{x}{2} + C$ (2) $\tan \frac{x}{2} + C$ (3) $\log \cos \frac{x}{2}$ (4) None of these
- 51. $\int x^x (1 + \log x) dx$ is equal to:
 - (1) $x^{2x} + C$ (2) $x^x + C$ (3) $x^x \log x$
- (4) None of these

- 52. $\int \frac{x}{x^2 + 4x + 5} dx$ is equal to:
 - (1) $\frac{1}{2}\log[x^2+4x+5]-2\tan^{-1}(x+2)+C$
 - (2) $\frac{1}{2} \log[(x+2)^2 1] + 2 \tan^{-1}(x+2) + C$
 - (3) $\frac{1}{2}\log[x^2+4x+5]+C$
 - (4) None of these
- 53. $\int \frac{dx}{\sin x \cos x}$ is equal to:
 - (1) $\log |\sin x| + C$

(2) $\log |\sec x| + C$

(3) $\log |\tan x| + C$

(4) None of these

54.
$$\int_{-\frac{1}{2}}^{\frac{1}{2}} (\cos x) \left[\log \left(\frac{1-x}{1+x} \right) \right] dx \text{ is equal to :}$$

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

55.
$$\int_{2}^{3} \frac{dx}{x^2 - x}$$
 is equal to:

- (1) $\log\left(\frac{2}{3}\right)$ (2) $\log\left(\frac{1}{4}\right)$ (3) $\log\left(\frac{8}{3}\right)$ (4) $\log\left(\frac{4}{3}\right)$

56. The value of
$$\int_{-\pi}^{\pi} (1-x^2) \sin x \cos^2 x \, dx$$
 is:

- (1) π
- (3) 2π
- (4) None of these

57. The area bounded by
$$y = \log x$$
, x-axis and ordinates $x = 1$, $x = 2$ is:

(1) $\log\left(\frac{4}{e}\right)$ sq. unit

(2) $\log\left(\frac{2}{e}\right)$ sq. unit

(3) log 4 sq. unit

(4) None of these

58. Area bounded by the curves
$$y = x^2$$
 and $y^2 = x$ is:

- (1) $\frac{2}{3}$ sq. unit (2) $\frac{1}{3}$ sq. unit
- (3) $\frac{1}{2}$ sq. unit
- (4) None of these

59. Area of region satisfying
$$x \le 2$$
, $y \le |x|$ and $x \ge 0$ is:

- (1) 4 sq. unit
- (2) 1 sq. unit
- (3) 2 sq. unit
- (4) None of these

60.
$$\int \frac{dx}{x^2 + 4x + 13}$$
 is equal to:

- (1) $\tan^{-1}\left(\frac{x+2}{3}\right) + C$
- (2) $\frac{1}{3} \tan^{-1} \frac{x}{2} + C$
- (3) $\tan^{-1}(x-2)+C$

(4) None of these

61. If
$$\vec{a} = \hat{i} + \hat{j} + \hat{k}$$
, $\vec{b} = 2\hat{i} - 4\hat{k}$, $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar, then the value of λ is:

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

62.	If $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and	$\vec{b} = 5\hat{i} - 3\hat{j} + \hat{k}$, then the projection of	of \vec{b}	on	à	is:	
-----	--	--	--------------	----	---	-----	--

- (1) 6
- (2) 5
- (3) 4

63. If \vec{a} , \vec{b} , \vec{c} are mutually perpendicular unit vectors, then $|\vec{a} + \vec{b} + \vec{c}|$ is equal to :

- (1) 3

- (4) 0

64. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + \hat{j}$, $\vec{c} = \hat{i}$ and $(\vec{a} \times \vec{b}) \times \vec{c} = \lambda \vec{a} + \mu \vec{b}$, then $\lambda + \mu$ is equal to:

A variable plane moves, so that the sum of the reciprocals of its intercepts on the coordinates axes is $\frac{1}{2}$. Then the plane passes through:

- (1) $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$ (2) (-1, 1, 1) (3) (2, 2, 2)
- (4) (0,0,0)

The equation of the plane which bisects the line joining (2, 3, 4) and (6, 7, 8) is:

(1) x + y + z - 15 = 0

(2) x + y + z + 15 = 0

(3) x-y-z-15=0

(4) x-y+z-15=0

The direction ratio of normal to the plane through (1, 0, 0), (0, 1, 0) which makes an angle $\frac{\pi}{4}$ with plane x + y = 3 are :

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

A line makes the same angle θ , with each of the x and z axes. If the angle β which it makes with y-axis is such that $\sin^2 \beta = 3\sin^2 \theta$, then $\cos^2 \theta$ is equal to:

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

69. The solution of $\frac{dy}{dx} = 2^{y-x}$ is:

- (1) $2^x + 2^y = C$ (2) $\frac{1}{2^x} \frac{1}{2^y} = C$ (3) $2^x 2^y = C$ (4) None of these

70. $y + x^2 = \frac{dy}{dx}$ has the solution:

(1) $y + x^2 + 2x + 2 = ce^x$

 $(2) \quad y + 2x = ce^x$

(3) $y + 2x + 2 = ce^x$

(4) None of these

observation is:

(1) 28.5

	(1) 28.5	(2)	29.6	(3)	30.5	(4)	30.1	
73.	The standard standard devia	deviation tion will	of 15 ite be:	ems is 6	and if eac	h item is	decreased by	1, ther
	(1) 5	(2)	7	(3)	6	(4)	None of thes	e
74.	If in a frequence its mode is app	ry distrib	ution, the ly:	mean an	d median	are 21 and	22 respective	ely, then
	(1) 24	(2)	42	(3)	22	(4)	20	
75.	A coin is tossed	4 times.	The proba	bility tha	t at least o	ne head tu	rns up is:	
	(1) $\frac{1}{16}$						None of thes	e
76.	One card is dra king or spade is	wn rand	omly fron	a pack o	f 52 cards	, then the	probability th	at it is a
	(1) $\frac{1}{13}$	(2)	2 13	(3)	3 13	(4)	4 13	
77.	A problem in 1	mathema	tics is giv	en to thr	ee student	ts A, B, C	and their re	spective
	probability of s	olving th	ne problen	n is $\frac{1}{2}$, $\frac{1}{2}$	and $\frac{1}{2}$.	Probability	that the pro	blem is
	solved, is:			2 3	4			8
	(1) $\frac{1}{3}$	(2)	$\frac{1}{2}$	(3)	$\frac{3}{4}$	(4)	2/3	
78.	Five coins whos	se faces a	re marked	l 2, 3 are	tossed. Th	e chance o	of obtaining a	total of
	(1) $\frac{1}{32}$	(2)	1 16	(3)	3 16	(4)	5 16	
79.	A card is drawn a heart, is:	from a p	ack of car	ds. The p	robability	that the ca	rd will be a q	ueen or
	(1) $\frac{2}{13}$	(2)	4 13	(3)	3 13	(4)	None of these	
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								1, 1, 0,

71. The solution of $x dy - y dx + x^2 e^x dx = 0$ is:

(1) $\frac{x}{y} + e^x = C$ (2) $x + e^y = C$ (3) $\frac{y}{x} + e^x = C$ (4) $y + e^x = C$

72. The algebraic sum of deviation of 20 observations measured from 30 is 2. The mean

				A
00	Tr - dian in thron	wn twice, the probabili	ty of occurrence of	at least once, is:
80.	(1) $\frac{11}{36}$	(2) $\frac{7}{12}$	(3) $\frac{35}{36}$	(4) None of these
81.	Five horses are	phility that Mr. B selec	ted the willing no	rses at random and bets on se, is:
	(1) $\frac{1}{5}$	(2) $\frac{2}{5}$	(3) $\frac{3}{5}$	(4) None of these
82.	If A and B are	events such that $P(A)$	$(B) = \frac{3}{4}, \ P(A \cap B) =$	$=\frac{1}{4}$, $P(\overline{A}) = \frac{2}{3}$, then $P(\overline{A} \cap B)$
	is: (1) $\frac{5}{12}$	(2) $\frac{3}{8}$	(3) $\frac{5}{8}$	(4) $\frac{1}{4}$
83.	A coin is tosse	d three times. The prol	pability of getting he	ead and tail alternatively, is:
00.	(1) $\frac{1}{8}$	(2) $\frac{1}{2}$	(3) $\frac{1}{4}$	(4) None of these
84.	that no two bl	ack balls are placed ad	jacently, equals:	aced in a row. The probability
	(1) $\frac{1}{13}$	(2) $\frac{2}{15}$	(3) $\frac{7}{15}$	(4) $\frac{1}{2}$
85.	The solution s	et of the equation sin	$^{1} x = 2 \tan^{-1} x \text{ is}$:	(1)
	(1) [1, 2]	(2) {-1, 2}	(3) {-1, 1, 0}	(4) $\left\{1, \frac{1}{2}, 0\right\}$
86	$\tan \left[\frac{1}{2}\sin^{-1}\left(\frac{1}{2}\right)\right]$	$\left(\frac{2a}{1+a^2}\right) + \frac{1}{2}\cos^{-1}\left(\frac{1-a^2}{1+a^2}\right)$	s equal to:	
		$(2) \frac{2a}{1-a^2}$		$(4) \ \frac{1+a^2}{1-a^2}$
87	$\tan^{-1}\frac{x}{y} - \tan^{-1}\frac{x}{y}$	$-1\frac{x-y}{x+y}$; $(x > y > 0)$ is e	equal to:	
	$(1) \frac{3\pi}{4}$	$(2) -\frac{\pi}{4}$	$(3) -\frac{3\pi}{4}$	$(4) \frac{\pi}{4}$
88	If in a triangl	e ABC, $\underline{A} = \tan^{-1} 2$ ar	and $\underline{B} = \tan^{-1} 3$, then	angle C is equal to:
	$(1) \frac{\pi}{4}$	$(2) \frac{3\pi}{4}$	$(3) -\frac{\pi}{4}$	(4) None of these

- 89. For real numbers x and y, we write $xRy \Leftrightarrow x^2 y^2 + \sqrt{3}$ is an irrational number. Then the relation R, is:
 - (1) Transitive
- (2) Reflexive
- (3) Symmetric
- (4) None of these
- A function f from the set of natural numbers to integers defined by 90. $f(x) = \begin{cases} \frac{n-1}{2} & \text{, when } n \text{ is odd} \\ -\frac{n}{2} & \text{, when } n \text{ is even} \end{cases}$
 - (1) one-one but not onto
- (2) onto but not one-one
- (3) one-one and onto both
- (4) none of these
- 91. Let R be the relation from $A = \{2, 3, 4, 5\}$ to $B = \{3, 6, 7, 10\}$ defined by 'x divides y', then R^{-1} is equal to
 - (1) {(6, 2), (3, 3)}

- (2) {(6, 2), (10, 2)}
- (3) {(6, 2), (10, 2), (3, 3), (6, 3), (10, 5)}
- (4) None of these
- 92. Which of the following is a singleton set?
 - (1) $\{x: |x| < 1, x \in Z\}$

(2) $\{x: |x| = 5, x \in Z\}$

(3) $\{x: x^2 = 1, x \in Z\}$

- (4) $\{x: x^2 + x + 1 = 0, x \in R\}$
- **93.** If $A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y) : y = e^{-x}, x \in R\}$, then $A \cap B$ is:
 - (1) empty set
- (2) not a set
- (3) singleton set (4) none of these
- **94.** If $A = \{(x,y): x^2 + y^2 = 25\}$ and $B = \{(x,y): x^2 + 9y^2 = 144\}$, then $A \cap B$ contains:
 - (1) one point
- (2) two points
- (3) three points (4) four points

- **95.** If $z = i \log (2 \sqrt{3})$, then $\cos z$ is equal to:
 - (1) i
- (2) 2
- (3) 3i
- (4) 2i

- **96.** The expression $\tan^2 \alpha + \cot^2 \alpha$ is:
 - $(1) \ge 2$
- $(2) \leq 2$
- (3) ≥ -2
- (4) None of these
- 97. A linear programming problem is concerned with finding the following value:
 - (1) only maximum value
- (2) optimal value
- (3) only minimum value
- (4) none of these

- **98.** The linear function Z = ax + by, where a, b are constants, which has to be maximized or minimized is called a:
 - (1) constraint

(2) function of any type

(3) linear objective function

(4) none of these

- 99. A compound statement is a statement which is made up of :
 - (1) only one statement

(2) any number of statements

(3) two or more statements

(4) none of these

- 100. A compound statement with an 'Or' is false when:
 - (1) one component statement is false
 - (2) none component statement is false
 - (3) both the component statements are false
 - (4) none of these

Used for Evaluation for OMR Sheets.

Total No. of Printed Pages: 13

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PG-EE-2016

SUBJECT: Mathematics Hons. Five Year

Sr. No
Total Questions : 100
Signature of the Invigilator)

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

- 1. All questions are compulsory.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PG-EE-2016/(Maths Hons Five Year)/(B)

- 1. If f(x) = x + 2, then f'[f(x)] at x = 4 is:

- (4) 5
- 2. The value of $\frac{d}{dx} \left[\left(\frac{\tan^2 2x \tan^2 x}{1 \tan^2 2x \tan^2 x} \right) \cot 3x \right]$ is:
 - (1) sec x
- (2) $\sec^3 x$
- (3) $\sec x \tan x$
- (4) $\sec^2 x$
- 3. If $x = a \sin \theta$, $y = b \cos \theta$, then $\frac{d^2y}{dx^2}$ is equal to:

 - (1) $\frac{b}{\sqrt{2}}\sec\theta$ (2) $-\frac{b}{\sqrt{2}}\sec^3\theta$ (3) $\frac{b}{a}\sec^2\theta$
- (4) None of these

- **4.** If $x^m y^n = (x + y)^{m+n}$, then $\frac{dy}{dx}$ is:

 - (1) $\frac{y}{x}$ (2) $\frac{x}{y}$
- (3) xy
- (4) None of these
- 5. Maximum slope of the curve $y = -x^3 + 3x^2 + 9x 27$ is:
- (2) 16
- (3) 12
- (4) 32

- **6.** The function x^x is increasing, when:
 - (1) $x > \frac{1}{a}$ (2) $x < \frac{1}{a}$ (3) x < 0
- (4) None of these
- The rate of change of the surface area of a sphere of radius r, when the radius is increasing at the rate of 2 cm/s is proportional to:
 - (1) $\frac{1}{-}$
- (2) r^2
- $(4) \frac{1}{2}$
- **8.** Angle between the tangents to the curve $y = x^2 5x + 6$ at the points (2, 0) and (3, 0) is:
 - (1) $\frac{\pi}{2}$
- (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{6}$ (4) $\frac{\pi}{4}$

- **9.** $\int \frac{(x+1)^2}{x(x^2+1)} dx$ is equal to:
- (1) $\log x + C$ (2) $2 \tan^{-1} x + C$ (3) $\log \frac{1}{1+x^2} + C$ (4) None of these

10.	$x + \sin x$	drie	Taracacan T	/ Western	
3.000	$\int_{1+\cos x}^{x+\sin x}$	ux is	equai	to	

- (1) $x \tan \frac{x}{2} + C$ (2) $\tan \frac{x}{2} + C$ (3) $\log \cos \frac{x}{2}$ (4) None of these

- 11. The straight line whose sum of the intercepts on the axes is equal to half of the product of the intercepts, passes through the point :
 - (1) (2,2)
- (2) (1, 1)
- (3) (4,4)
- (4) (3, 3)
- 12. The equation of a circle with centre (1, 2) and tangent x + y 5 = 0 is:
 - (1) $x^2 + y^2 + 2x 4y + 6 = 0$
- (2) $x^2 + y^2 2x 4y + 3 = 0$
- (3) $x^2 + y^2 2x + 4y + 8 = 0$
- (4) $x^2 + y^2 2x 4y + 8 = 0$
- The distance between the foci of an ellipse is 16 and the eccentricity is $\frac{1}{2}$. Length of major axis of the ellipse is:
 - (1) 8
- (2) 16
- (3) 32
- (4) 64
- 14. The ratio in which the line joining (2, 4, 5) and (3, 5, -4) is divided by the yz-plane is:
 - (1) 4:-3
- (2) 3:2
- (3) 2:3
- (4) -2:3
- 15. A plane makes intercepts 3 and 4 respectively on z-axis and x-axis. If plane is parallel to y-axis, then its equation is:
 - (1) 3z + 4x = 12

- (2) 3y + 4z = 12 (3) 3x + 4z = 12 (4) 3z + 4y = 12
- $\lim_{x\to 0} \frac{0}{x \tan(\pi+x)}$ is equal to:
 - (1) 2
- (2) $\frac{1}{2}$
- (3) -2
- (4) None of these

- 17. The points of discontinuity of tan x are:
 - (1) $x = n\pi$
- (2) 2nπ
- (3) $(2n+1)\frac{\pi}{2}$ (4) $-2n\pi$

where $n \in I$

- **18.** If $xy = e^{x-y}$, then $\frac{dy}{dx}$ is equal to:
 - (1) $\frac{(x-1)y}{x(1+y)}$ (2) $\frac{(x+1)y}{x(1+y)}$ (3) $\frac{(x-1)y}{x(1-y)}$
- (4) None of these

10	T6 ./-	$1 + \sin x - \cos x$	thon	dy	io agreal to	02
19.	M 9 -	$\frac{1+\sin x-\cos x}{1+\sin x+\cos x},$	men	dx	is equal to	

- (1) $\frac{1}{\cos x}$ (2) $\frac{1}{\sin x}$ (3) $\frac{1}{1-\cos x}$
- (4) None of these

20. If
$$A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$$
, then A^{100} is equal to :

- (1) 2100 A
- (2) 100 A
- (3) 2⁹⁹ A
- (4) 299 A
- 21. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ are:
- (2) 18
- (4) 100

22. If
$$f(x) = 1 - \frac{1}{x}$$
, then the value of $f\left[f\left(\frac{1}{x}\right)\right]$ is:

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

23. The function
$$f(x) = \log(x + \sqrt{x^2 + 1})$$
 is:

(1) an even function

(2) an odd function

(3) a periodic function

(4) None of these

24. The value of
$$\sin A \sin(60^\circ + A) \sin(60^\circ - A)$$
 is equal to:

- (1) sin 3A

- (2) $\sin \frac{3A}{2}$ (3) $\sin \frac{3A}{4}$ (4) $\sin \frac{4A}{3}$

25. If
$$\cos \theta = \frac{1}{2} \left(x + \frac{1}{x} \right)$$
, then $\frac{1}{2} \left(x^2 + \frac{1}{x^2} \right)$ is equal to :

- (1) cos 2θ
- (2) sin 20
- (3) sec 2θ
- (4) tan 20

26. If
$$y = \sin^2 \theta + \csc^2 \theta$$
, $\theta \neq 0$, then:

- (1) y > 2
- (3) $y \ge -2$
- (4) y = 0

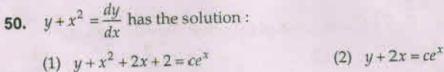
27. The value of
$$\frac{\cos 12^{\circ} - \sin 12^{\circ}}{\cos 12^{\circ} + \sin 12^{\circ}} + \frac{\sin 147^{\circ}}{\cos 147^{\circ}}$$
 is equal to:

- (1) 0
- (2) -1
- (3) 1
- (4) None of these

28.	P(n): 1+3+5+	+ $(2n-1) = n^2$ is	4 7	
77670	(1) true for $n > 1$		(2) true for no n(4) None of these	10
29.	Cashier always sit t	of a committee si ogether, then the nu	t at a round table s umber of arrangemen	so that the President and its is: (4) None of these
	(1) <u>[10</u> × 2	(2) <u>19</u> ×2	(3) 10	(4) 140110 01 11-22
30,	In how many ways	can 5 keys be put in	n a ring?	14
	(1) 15	(2) $\frac{15}{2}$	(3) 4	(4) $\frac{14}{2}$
31.	Let R be the relation then R^{-1} is equal to	on from $A = \{2, 3, 4\}$	$\{1, 5\}$ to $B = \{3, 6, 7, 16\}$	0) defined by 'x divides y'.
	(1) {(6, 2), (3, 3)}		(2) {(6, 2), (10, 2)}	
	(3) {(6, 2), (10, 2), ((3, 3), (6, 3), (10, 5)}	(4) None of these	
32.	Which of the follow		set?	200
-	(1) $\{x: x < 1, x \in$		(2) $\{x: x = 5, x\}$	€ Z
	(3) $\{x: x^2 = 1, x \in A\}$		(4) $\{x: x^2 + x + 1\}$	$=0, x \in R$
33			$(x,y): y=e^{-x}, x\in R),$, then $A \cap B$ is:
	(1) empty set	(2) not a set	(3) singleton set	(4) none of these
34	1. If $A = \{(x, y) : x^2 + (x, y) : x^2 + (x, y) = (x, y$	$y^2 = 25$ and $B = \{(x^2 + y^2) x^2 = 25\}$	$(x,y): x^2 + 9y^2 = 144$,	then $A \cap B$ contains:
	(1) one point	(2) two points	(3) three points	(4) four points
35	5. If $z = i \log (2 - \sqrt{3})$), then cos z is equa	al to:	
	(1) i	(2) 2	(3) 3 <i>i</i>	(4) 2 <i>i</i>
30	6. The expression to	$an^2 \alpha + \cot^2 \alpha$ is:		
	(1) ≥2	(2) ≤2	(3) ≥ -2	(4) None of these
3	7. A linear program	nming problem is co	oncerned with finding	g the following value:
	(1) only maximu	um value	(2) optimal vail	ie
	(3) only minimu	im value	(4) none of thes	se
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	38.	The linear function $Z = ax + by$, where a , b are constants, which has to be maximized or minimized is called a:							
		(1) constraint		(2) function of	any type				
		(3) linear objects	ive function	(4) none of the	se				
	39.	A compound sta	tement is a statemer	nt which is made up	of:				
		(1) only one stat	tement	(2) any number	r of statements				
		(3) two or more	statements	(4) none of the	se				
	40.	A compound statement with an 'Or' is false when:							
		(1) one component statement is false							
		(2) none component statement is false							
		1 No. 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1							
		(3) both the component statements are false							
	44	(4) none of these If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - 4\hat{k}$, $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar, then the value of λ is:							
	41.	$11 \ a = 1 + j + k , b$	$r = 2i - 4\kappa$, $c = i + \kappa$	1+3k are copianar,	then the value of λ is:				
		(1) $\frac{5}{3}$	(2) $\frac{3}{5}$	(3) $\frac{3}{2}$	(4) $\frac{7}{3}$				
	42.	If $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$ and $\vec{b} = 5\hat{i} - 3\hat{j} + \hat{k}$, then the projection of \vec{b} on \vec{a} is:							
		(1) 6	(2) 5	(3) 4	(4) 3				
	43.	If \vec{a} , \vec{b} , \vec{c} are r	mutually perpendicu	ılar unit vectors, the	en $ \vec{a} + \vec{b} + \vec{c} $ is equa	l to:			
		(1) 3	(2) √3	(3) 1	(4) 0				
	44.	If $\vec{a} = \hat{i} + \hat{i} + \hat{k}$. \vec{b}	$\vec{i} = \hat{i} + \hat{i}$, $\vec{c} = \hat{i}$ and ($\overrightarrow{a} \times \overrightarrow{b} \times \overrightarrow{c} = \lambda \overrightarrow{a} + u$	\vec{b} , then $\lambda + \mu$ is equal	to.			
	972	(1) 3	(2) 1	(3) 0	(4) 2				
	45.	A variable plane	moves, so that the		ocals of its intercepts	on the			
		A variable plane moves, so that the sum of the reciprocals of its intercepts on the coordinates axes is $\frac{1}{2}$. Then the plane passes through:							
		3 2	-						
		(1) $\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$	(2) (-1, 1, 1)	(3) (2, 2, 2)	(4) (0, 0, 0)				
	46.	The equation of t	he plane which bise	cts the line joining (2, 3, 4) and (6, 7, 8) is:				
		(1) $x + y + z - 15$	= 0	(2) $x + y + z + 1$	5 = 0				
		(3) $x-y-z-15$	= 0	(4) $x-y+z-1$	5 = 0				
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-		The second secon	The second second						

		3			
6					Е
47.	The direction ratio	of normal to the	plane through (1, 0, 0), (0, 1, 0) which make	es an
	angle $\frac{\pi}{4}$ with plan				
	(1) $1, \sqrt{2}, 1$	(2) 1, 1, $\sqrt{2}$	(3) 1, 1, 2	(4) $\sqrt{2}$, 1, 1	
48.	A line makes the	same angle A. with	each of the x and z a = $3 \sin^2 \theta$, then $\cos^2 \theta$	ixes. If the angle β wh	ich it
		(2) $\frac{1}{5}$	(3) $\frac{2}{3}$	(4) $\frac{3}{5}$	
49.	The solution of $\frac{dy}{dz}$				
	(1) $2^x + 2^y = C$	$(2) \ \frac{1}{2^x} - \frac{1}{2^y} = C$	(3) $2^x - 2^y = C$	(4) None of these	
50.	$y + x^2 = \frac{dy}{dx}$ has the	ne solution :			



(3)
$$y + 2x + 2 = ce^x$$
 (4) None of these

51. If A is a square matrix, then (A + A') is: (2) symmetric matrix

(1) unit matrix (4) skew-symmetric matrix (3) non-singular matrix

52. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$ is:

(4) no real value (2) -1 (1) 1

53. If $A = \begin{bmatrix} 0 & 3 \\ 2 & 0 \end{bmatrix}$ and $A^{-1} = \lambda(\text{adj } A)$, then λ is equal to:

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

54. If A is a square matrix such that AA' = I = A'A, then |A| is equal to:

(4) None of these $(3) \pm 1$ $(2) \pm 2$ (1) 0

55. If w is a complex cube root of unity, then
$$\begin{vmatrix} 1 & w & -w^2/2 \\ 1 & 1 & 1 \\ 1 & -1 & 0 \end{vmatrix}$$
 is equal to:

- (1) 1
- (2) w
- (3) 0

56. If
$$C = 2 \cos \theta$$
, then the value of the determinant $\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & C \end{vmatrix}$ is:

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

(2) $4\cos^2\theta(2\cos\theta-1)$

(3) $\frac{2\sin^2 2\theta}{\sin \theta}$

(4) None of these

57.
$$x + ky - z = 0$$
, $3x - ky - z = 0$ and $x - 3y + z = 0$ has non-zero solution for k is equal to :

- (1) 0
- (3) -1
- (4) None of these

58. If
$$A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$$
, then A^{-1} is equal to:

- (1) $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (2) $\begin{bmatrix} -\frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & \frac{1}{11} \end{bmatrix}$ (3) $\begin{bmatrix} \frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (4) None of these

59. If
$$A = \begin{bmatrix} 1 & \log_b^a \\ \log_a^b & 1 \end{bmatrix}$$
, then $|A|$ is equal to:

- (1) 0
- (2) 1
- (3) \log_b^a (4) \log_a^b

60. If
$$y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots + \infty}}}$$
, then $\frac{dy}{dx}$ is equal to:

- (1) $-\frac{\cos x}{2y-1}$ (2) $\frac{\sin x}{1-2y}$ (3) $\frac{\cos x}{2y-1}$ (4) None of these

61. The solution of
$$x dy - y dx + x^2 e^x dx = 0$$
 is:

- (1) $\frac{x}{y} + e^x = C$ (2) $x + e^y = C$ (3) $\frac{y}{x} + e^x = C$ (4) $y + e^x = C$

observation is:		viation or	20 obser	vations me	easured tr	om 30 is 2. The mear
(1) 28.5	(2)	29.6	(3)	30.5	(4)	30.1
The standard devia			ns is 6 a	ind if each	item is	decreased by 1, ther
(1) 5	(2)	7-5	(3)	6	(4)	None of these
			nean and	d median a	are 21 and	22 respectively, ther
(1) 24	(2)	2	(3)	22	(4)	20
A coin is tossed	4 times.	The probal	oility that	t at least or	ne head tu	rns up is :
(1) $\frac{1}{16}$		V/4x2				
		mly from	a pack o	f 52 cards,	then the	probability that it is a
The state of the s		<u>2</u> 13	(3)	3 13	(4)	4 13
	solving th	e problem	is $\frac{1}{2}$, $\frac{1}{3}$	and $\frac{1}{4}$. 1	Probability	that the problem is
Five coins who	se faces a			7		2
12 is :	oc taces a	C IIIII NCU	2, 3 are	tossed. The		3 of obtaining a total of
12 is :				tossed. The $\frac{3}{16}$	e chance o	of obtaining a total of
12 is: (1) $\frac{1}{32}$	(2)	16	(3)	3 16	e chance (of obtaining a total of
12 is: $(1) \frac{1}{32}$ A card is drawn	(2)	1 16 ack of care	(3)	3 16 robability	e chance (4) that the ca	of obtaining a total of $\frac{5}{16}$
12 is: $(1) \frac{1}{32}$ A card is drawn a heart, is:	(2) = 1 (2) = 1	1 16 ack of card 4 3	(3) ds. The p (3)	$\frac{3}{16}$ robability ((4) that the ca	of obtaining a total of $\frac{5}{16}$ and will be a queen or None of these
	If in a frequence its mode is appropriate (1) 24 A coin is tossed (1) $\frac{1}{16}$ One card is drawking or spade is (1) $\frac{1}{13}$ A problem in a probability of solved, is:	If in a frequency distribution its mode is approximately (1) 24 (2) 4 A coin is tossed 4 times. The coin is tossed 4 times. The coin is drawn random king or spade is: (1) $\frac{1}{16}$ (2) $\frac{1}{16}$ A problem in mathematic probability of solving the solved, is:	If in a frequency distribution, the rits mode is approximately: (1) 24 (2) 42 A coin is tossed 4 times. The probable (1) $\frac{1}{16}$ (2) $\frac{15}{16}$ One card is drawn randomly from king or spade is: (1) $\frac{1}{13}$ (2) $\frac{2}{13}$ A problem in mathematics is given probability of solving the problem solved, is:	If in a frequency distribution, the mean and its mode is approximately: (1) 24 (2) 42 (3) A coin is tossed 4 times. The probability that (1) $\frac{1}{16}$ (2) $\frac{15}{16}$ (3) One card is drawn randomly from a pack oking or spade is: (1) $\frac{1}{13}$ (2) $\frac{2}{13}$ (3) A problem in mathematics is given to the probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ solved, is:	If in a frequency distribution, the mean and median a its mode is approximately: (1) 24 (2) 42 (3) 22 A coin is tossed 4 times. The probability that at least or (1) $\frac{1}{16}$ (2) $\frac{15}{16}$ (3) $\frac{2}{16}$ One card is drawn randomly from a pack of 52 cards, king or spade is: (1) $\frac{1}{13}$ (2) $\frac{2}{13}$ (3) $\frac{3}{13}$ A problem in mathematics is given to three student probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. It solved, is:	If in a frequency distribution, the mean and median are 21 and its mode is approximately: (1) 24 (2) 42 (3) 22 (4) A coin is tossed 4 times. The probability that at least one head to (1) $\frac{1}{16}$ (2) $\frac{15}{16}$ (3) $\frac{2}{16}$ (4) One card is drawn randomly from a pack of 52 cards, then the king or spade is: (1) $\frac{1}{13}$ (2) $\frac{2}{13}$ (3) $\frac{3}{13}$ (4) A problem in mathematics is given to three students A, B, C probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Probability solved, is:

71.	Five horses are in the race. Mr. B selects two of the horses at random and bets on							
	them. The probability that Mr. B selected the winning horse, is :							

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

72. If A and B are events such that
$$P(A \cup B) = \frac{3}{4}$$
, $P(A \cap B) = \frac{1}{4}$, $P(\overline{A}) = \frac{2}{3}$, then $P(\overline{A} \cap B)$

is:

- (1) $\frac{5}{12}$
- (2) $\frac{3}{8}$
- (3) $\frac{5}{9}$ (4) $\frac{1}{4}$

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

- (2) $\frac{2}{15}$
- $(3) \frac{7}{15}$
- $(4) \frac{1}{2}$

75. The solution set of the equation
$$\sin^{-1} x = 2 \tan^{-1} x$$
 is:

- (1) [1, 2]
- (2) $\{-1,2\}$
- (3) [-1, 1, 0]
- $\{1,\frac{1}{2},0\}$

76.
$$\tan \left[\frac{1}{2} \sin^{-1} \left(\frac{2a}{1+a^2} \right) + \frac{1}{2} \cos^{-1} \left(\frac{1-a^2}{1+a^2} \right) \right]$$
 is equal to :

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

77.
$$\tan^{-1} \frac{x}{y} - \tan^{-1} \frac{x-y}{x+y}$$
; $(x > y > 0)$ is equal to:

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

78. If in a triangle ABC,
$$A = \tan^{-1} 2$$
 and $B = \tan^{-1} 3$, then angle C is equal to:

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

the relation R, is: (1) Transitive (2) Reflexive	(3) Symmetric (4) None of these
80. A function f from the set of	of natural numbers to integers defined by
$f(x) = \begin{cases} \frac{n-1}{2} & \text{, when } n \text{ is odd} \\ -\frac{n}{2} & \text{, when } n \text{ is even} \end{cases}$	is:
(1) one-one but not onto	(2) onto but not one-one
(3) one-one and onto both	(4) none of these
81. A lady gives a dinner party for six selected from among ten friends, together, is:	guests. The number of ways in which they may be, if two of the friends will not attend the party
(1) 164 (2) 140	(3) 112 (4) 40
82. If w is an imaginary cube root of w	nity, then $(1+w-w^2)$ is equal to:
(1) 128 w (2) -128 w	(3) $-128w^2$ (4) $128w^2$
83. The equation $z\bar{z} + (2-3i)z + (2+3i)z +$	(i) $\bar{z} + 4 = 0$ represents a circle of radius:
(1) 3 (2) 4	(3) 2 (4) 6
84. If the roots of the equation $qx^2 + roots$ of the equation $x^2 - 4qx + p^2$	px + q = 0 are complex, where p , q are real; then the q are:
(1) real and equal	(2) imaginary
(3) real and unequal	(4) none of these
85. If $a + b = 8$, then ab is greatest who	en:
(1) $a = 3, b = 5$ (2) $a = 4, b =$	and the same
86. If the coefficient of 7th and 13th	term in the expansion of $(1+x)^n$ are equal, then n is
equal to: (1) 10 (2) 20	(3) 15 (4) 18
PG-EE-2016/(Mathematics Hons.)/(B)	

87.	If "c, denotes	the number of	of	combinations	of n	things	taken	r at	a	time,	then	the
	expression "c,	$c_{r-1} + {}^{n}c_{r-1} + 2 \times {}^{n}$	c,	equals:								

- (2) $^{n+2}c_{r+1}$ (3) $^{n+1}c_r$
- (4) $^{n+1}c_{r+1}$
- The number which should be added to the numbers 2, 14, 62, so that the resulting numbers may be in G. P. is:
 - (1) 4

- 89. If the roots of the equation $x^3 12x^2 + 39x 28 = 0$ are in A. P., then their common difference is:
 - $(1) \pm 2$
- $(2) \pm 4$
- $(3) \pm 1$
- 90. The equation of the straight line joining the origin to the point of intersection of y-x+7=0 and y+2x-2=0 is:
 - (1) 3x + 4y = 0

- (2) 4x + 3y = 0 (3) 3x 4y = 0 (4) 4x 3y = 0
- **91.** $\int x^x (1 + \log x) dx$ is equal to:
- (1) $x^{2x} + C$ (2) $x^x + C$ (3) $x^x \log x$
- (4) None of these

92.
$$\int \frac{x}{x^2 + 4x + 5} dx$$
 is equal to ;

(1)
$$\frac{1}{2}\log[x^2+4x+5]-2\tan^{-1}(x+2)+C$$

(2)
$$\frac{1}{2} \log \left[(x+2)^2 - 1 \right] + 2 \tan^{-1} (x+2) + C$$

(3)
$$\frac{1}{2}\log[x^2+4x+5]+C$$

(4) None of these

93.
$$\int \frac{dx}{\sin x \cos x}$$
 is equal to:

(1) $\log |\sin x| + C$

(2) $\log |\sec x| + C$

(3) $\log |\tan x| + C$

(4) None of these

94.
$$\int_{-\frac{1}{2}}^{\frac{1}{2}} (\cos x) \left[\log \left(\frac{1-x}{1+x} \right) \right] dx \text{ is equal to :}$$

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

95.
$$\int_{2}^{3} \frac{dx}{x^2 - x}$$
 is equal to:

- (1) $\log\left(\frac{2}{3}\right)$ (2) $\log\left(\frac{1}{4}\right)$ (3) $\log\left(\frac{8}{3}\right)$ (4) $\log\left(\frac{4}{3}\right)$

96. The value of
$$\int_{0}^{\pi} (1-x^2) \sin x \cos^2 x \, dx$$
 is:

- (1) π
- (2) 0
- $(3) 2\pi$
- (4) None of these

97. The area bounded by
$$y = \log x$$
, x -axis and ordinates $x = 1$, $x = 2$ is:

(1) $\log\left(\frac{4}{e}\right)$ sq. unit

(2) $\log\left(\frac{2}{a}\right)$ sq. unit

(3) log 4 sq. unit

(4) None of these

98. Area bounded by the curves
$$y = x^2$$
 and $y^2 = x$ is:

- (1) $\frac{2}{3}$ sq. unit (2) $\frac{1}{3}$ sq. unit (3) $\frac{1}{2}$ sq. unit
- (4) None of these

99. Area of region satisfying
$$x \le 2$$
, $y \le |x|$ and $x \ge 0$ is:

- (1) 4 sq. unit
- (2) 1 sq. unit
- (3) 2 sq. unit
- (4) None of these

100.
$$\int \frac{dx}{x^2 + 4x + 13}$$
 is equal to :

(1) $\tan^{-1}\left(\frac{x+2}{3}\right) + C$

(2) $\frac{1}{3} \tan^{-1} \frac{x}{2} + C$

(3) $\tan^{-1}(x-2) + C$

(4) None of these

red for Evaluation for MR Sheets

(DO NOT OPEN THIS OUTSTION FORM FOR THE Pages: 13

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

PG-EE-2016

SUBJECT: Mathematics Hons. Five Year

C		Sr. No10099
Time : 11/4 Hours Roll No. (in figures)	Max. Marks : 100 (in words)	Total Questions : 100
Name Mother's Name	Father's Name Date of Examination	
(Signature of the Candidate)		/Signature of the Investment

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

(Signature of the Invigilator)

- 1. All questions are compulsory.
- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. The candidate must not do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers must not be ticked in the question booklet.
- There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

PG-EE-2016/(Maths Hons Five Year)/(C)

1	 A lady gives a d selected from a together, is: 	linner party for six g mong ten friends,	guests. The number of two of the friend	of ways in which they may ls will not attend the pa	y be arty
	(1) 164	(2) 140	(3) 112	(4) 40	
2	· If w is an imagin	ary cube root of uni	ty, then $(1+w-w^2)$ i	s equal to :	
	(1) 128 w	(2) -128 w	(3) $-128 w^2$	(4) $128w^2$	
3.		+(2-3i)z+(2+3i)	$\bar{z} + 4 = 0$ represents	a circle of radius :	
	(1) 3	(2) 4	(3) 2	(4) 6	
4.	If the roots of the roots of the equa	e equation $qx^2 + px$ tion $x^2 - 4qx + p^2 = 0$	+q=0 are complex, 0 are:	where p , q are real; then	the
	(1) real and equ		(2) imaginary		
	(3) real and une	qual	(4) none of these		
5.		ab is greatest when: (2) $a = 4, b = 4$		(4) None of these	
6.	If the coefficient equal to:	of 7th and 13th term	n in the expansion of	$(1+x)^n$ are equal, then t	ı is
	(1) 10	(2) 20	(3) 15	(4) 18	
7.	If nc_r denotes the expression ${}^nc_{r+1}$	ne number of comb + ${}^{n}c_{r-1}$ + $2 \times {}^{n}c_{r}$ equa	inations of <i>n</i> things	taken r at a time, then t	the
	(1) $^{n+2}c_r$	(2) $^{n+2}c_{r+1}$	(3) n+1c _r	(4) $^{n+1}c_{r+1}$	
8.	The number whi numbers may be	ch should be added in G. P. is:	I to the numbers 2,	14, 62, so that the resulti	ng
	(1) 4	(2) 3	(3) 2	(4) 1	
9.	If the roots of the difference is:	equation $x^3 - 12x^2$	+39x - 28 = 0 are in	A. P., then their comme	on
	(1) ± 2	(2) ±4	(3) ±1	(4) ±3	
10.	The equation of $y-x+7=0$ and y	the straight line joi $x + 2x - 2 = 0$ is:	ning the origin to t	he point of intersection	of
	(1) $3x + 4y = 0$		(3) $3x - 4y = 0$	(4) $4x - 3y = 0$	
PG-EE	-2016/(Mathematic	s Hons.)/(C)		p.m	0

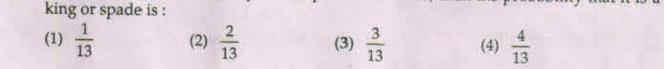
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11.	Let R be the relation from $A = \{2, 3, 4\}$ then R^{-1} is equal to:	4, 5) to $B = \{3, 6, 7, 10\}$ defined by 'x divides
	(1) {(6, 2), (3, 3)}	(2) {(6, 2), (10, 2)}
	(3) ((6, 2), (10, 2), (3, 3), (6, 3), (10, 5))	(4) None of these
12.	Which of the following is a singleton s	et?
1	(1) $\{x: x < 1, x \in Z\}$	(2) $\{x: x = 5, x \in Z\}$
	(3) $\{x: x^2 = 1, x \in Z\}$	(4) $\{x: x^2 + x + 1 = 0, x \in R\}$
13.	If $A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y) : y = e^x, x \in R\}$	$(v): y = e^{-x}$ $x \in \mathbb{R}$ then $A \cap \mathbb{R}$ is:
	(1) empty set (2) not a set	(3) singleton set (4) none of these
14.		y): $x^2 + 9y^2 = 144$, then $A \cap B$ contains:
	(1) one point (2) two points	
15	If $z = i \log (2 - \sqrt{3})$, then $\cos z$ is equal	
10.	(1) i (2) 2	
	- N	(3) 3i (4) 2i
16.	The expression $\tan^2 \alpha + \cot^2 \alpha$ is:	
	$(1) \geq 2 \qquad (2) \leq 2$	(3) \geq −2 (4) None of these
17.	A linear programming problem is conc	erned with finding the following value:
	(1) only maximum value	(2) optimal value
	(3) only minimum value	(4) none of these
18.	The linear function $Z = ax + by$, where or minimized is called a:	a, b are constants, which has to be maximize
	(1) constraint	(2) function of any type
	(3) linear objective function	(4) none of these
19.	A compound statement is a statement v	which is made up of:
	(1) only one statement	(2) any number of statements
	(3) two or more statements	(4) none of these
20.	A compound statement with an 'Or' is f	alse when:
	(1) one component statement is false	
	(2) none component statement is false	
	(3) both the component statements are	false

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(4) none of these

la				
21.	The solution of x	$dy - y dx + x^2 e^x dx$	= 0 is:	
	$(1) \frac{x}{y} + e^x = C$	$(2) x + e^y = C$	$(3) \frac{y}{x} + e^x = C$	$(4) y + e^x = C$
22.	The algebraic sur observation is:	m of deviation of	20 observations measu	ared from 30 is 2. The mean
	(1) 28.5	(2) 29.6	(3) 30.5	(4) 30.1
23.	The standard de standard deviation	viation of 15 iten in will be:	ns is 6 and if each ite	em is decreased by 1, then
	(1) 5	(2) 7	(3) 6	(4) None of these
24.	If in a frequency its mode is approx	distribution, the n	nean and median are	21 and 22 respectively, then
	(1) 24	(2) 42	(3) 22	(4) 20
25.	A coin is tossed 4	times. The probab	ility that at least one h	ead turns up is :
	(1) $\frac{1}{16}$			(4) None of these
26.	One card is drawn	n randomly from	a pack of 52 cards, the	n the probability that it is a



- 27. A problem in mathematics is given to three students A, B, C and their respective probability of solving the problem is $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$. Probability that the problem is solved, is:
 - (1) $\frac{1}{3}$ (2) $\frac{1}{2}$ (3) $\frac{3}{4}$ (4) $\frac{2}{3}$
- 28. Five coins whose faces are marked 2, 3 are tossed. The chance of obtaining a total of 12 is:
 - (1) $\frac{1}{32}$ (2) $\frac{1}{16}$ (3) $\frac{3}{16}$ (4) $\frac{5}{16}$
- 29. A card is drawn from a pack of cards. The probability that the card will be a queen or a heart, is:
 - (1) $\frac{2}{13}$ (2) $\frac{4}{13}$ (3) $\frac{3}{13}$ (4) None of these

- If a dice is thrown twice, the probability of occurrence of 4 at least once, is:

- (4) None of these

- $\int x^{x} (1 + \log x) dx$ is equal to :
 - (1) $x^{2x} + C$ (2) $x^x + C$
- (3) $x^x \log x$
- (4) None of these

- 32. $\int \frac{x}{x^2 + 4x + 5} dx$ is equal to:
 - (1) $\frac{1}{2}\log[x^2+4x+5]-2\tan^{-1}(x+2)+C$
 - (2) $\frac{1}{2} \log[(x+2)^2 1] + 2 \tan^{-1}(x+2) + C$
 - (3) $\frac{1}{2}\log[x^2+4x+5]+C$
 - (4) None of these
- $\int \frac{dx}{\sin x \cos x}$ is equal to:
 - (1) $\log |\sin x| + C$

(2) $\log |\sec x| + C$

(3) $\log |\tan x| + C$

- (4) None of these
- 34. $\int_{1}^{2} (\cos x) \left[\log \left(\frac{1-x}{1+x} \right) \right] dx$ is equal to:

 - (1) 1 (2) $e^{\frac{1}{2}}$
- (3) 0

- **35.** $\int_{0}^{3} \frac{dx}{x^2 x}$ is equal to:

 - (1) $\log\left(\frac{2}{3}\right)$ (2) $\log\left(\frac{1}{4}\right)$
- (3) $\log\left(\frac{8}{3}\right)$
- (4) $\log\left(\frac{4}{3}\right)$

- **36.** The value of $\int_{0}^{\pi} (1-x^2) \sin x \cos^2 x \, dx$ is:
- $(3) 2\pi$
- (4) None of these

- **37.** The area bounded by $y = \log x$, x-axis and ordinates x = 1, x = 2 is:
 - (1) $\log\left(\frac{4}{a}\right)$ sq. unit

(2) $\log\left(\frac{2}{a}\right)$ sq. unit

(3) log 4 sq. unit

- (4) None of these
- Area bounded by the curves $y = x^2$ and $y^2 = x$ is:

 - (1) $\frac{2}{3}$ sq. unit (2) $\frac{1}{3}$ sq. unit (3) $\frac{1}{2}$ sq. unit
- (4) None of these
- Area of region satisfying $x \le 2$, $y \le |x|$ and $x \ge 0$ is:
 - (1) 4 sq. unit
- (2) 1 sq. unit
- (3) 2 sq. unit
- (4) None of these

- 40. $\int \frac{dx}{x^2 + 4x + 13}$ is equal to:
 - (1) $\tan^{-1}\left(\frac{x+2}{3}\right) + C$

(2) $\frac{1}{3} \tan^{-1} \frac{x}{2} + C$

(3) $tan^{-1}(x-2)+C$

- (4) None of these
- **41.** If A is a square matrix, then (A + A') is:
 - (1) unit matrix

- (2) symmetric matrix
- (3) non-singular matrix

- (4) skew-symmetric matrix
- **42.** If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$ is:
 - (1) 1
- (3) 4
- (4) no real value
- **43.** If $A = \begin{bmatrix} 0 & 3 \\ 2 & 0 \end{bmatrix}$ and $A^{-1} = \lambda(\text{adj } A)$, then λ is equal to:
 - (1) $-\frac{1}{6}$ (2) $\frac{1}{6}$ (3) $\frac{1}{3}$
- $(4) -\frac{1}{2}$
- **44.** If A is a square matrix such that AA' = I = A'A, then |A| is equal to:
 - (1) 0
- $(3) \pm 1$
- (4) None of these

- **45.** If w is a complex cube root of unity, then $\begin{vmatrix} 1 & w & -w^2/2 \\ 1 & 1 & 1 \\ 1 & -1 & 0 \end{vmatrix}$ is equal to:
 - (1) 1
- (3) 0
- If $C = 2 \cos \theta$, then the value of the determinant $\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \end{vmatrix}$ is:
 - (1) $\frac{\sin 4\theta}{\sin \theta}$

(2) $4\cos^2\theta(2\cos\theta - 1)$

(3) $\frac{2\sin^2 2\theta}{\sin \theta}$

- (4) None of these
- 47. x + ky z = 0, 3x ky z = 0 and x 3y + z = 0 has non-zero solution for k is equal to:
 - (1) 0
- (3) -1
- (4) None of these

- **48.** If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$, then A^{-1} is equal to:
- (1) $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (2) $\begin{bmatrix} -\frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & \frac{1}{11} \end{bmatrix}$ (3) $\begin{bmatrix} \frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (4) None of these

- **49.** If $A = \begin{bmatrix} 1 & \log_b^a \\ \log^b & 1 \end{bmatrix}$, then |A| is equal to:
 - (1) 0
- (2) 1
- (3) \log_b^a (4) \log_a^b
- **50.** If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots + \infty}}}$, then $\frac{dy}{dx}$ is equal to:
 - (1) $-\frac{\cos x}{2y-1}$ (2) $\frac{\sin x}{1-2y}$ (3) $\frac{\cos x}{2y-1}$
- (4) None of these
- The straight line whose sum of the intercepts on the axes is equal to half of the product of the intercepts, passes through the point :
 - (1) (2,2)
- (2) (1,1)
- (3) (4,4)
- (4) (3,3)

- The equation of a circle with centre (1, 2) and tangent x + y 5 = 0 is:
 - (1) $x^2 + y^2 + 2x 4y + 6 = 0$
- (2) $x^2 + y^2 2x 4y + 3 = 0$
- (3) $x^2 + y^2 2x + 4y + 8 = 0$
- (4) $x^2 + y^2 2x 4y + 8 = 0$
- The distance between the foci of an ellipse is 16 and the eccentricity is $\frac{1}{2}$. Length of 53. major axis of the ellipse is:
 - (1) 8
- (2) 16
- (3) 32
- (4) 64
- The ratio in which the line joining (2, 4, 5) and (3, 5, -4) is divided by the yz-plane is :
 - (1) 4:-3
- (2) 3:2
- (3) 2:3
- A plane makes intercepts 3 and 4 respectively on z-axis and x-axis. If plane is parallel to y-axis, then its equation is:
 - (1) 3z + 4x = 12
- (2) 3y + 4z = 12
- (3) 3x + 4z = 12 (4) 3z + 4y = 12
- $\lim_{x\to 0} \frac{\int y \, dy}{x \tan(\pi + x)}$ is equal to: 56.
 - (1) 2
- $(2) \frac{1}{2}$
- (3) -2
- (4) None of these

- The points of discontinuity of tan x are:
 - (1) $x = n\pi$
- (2) 2nn
- (3) $(2n+1)\frac{\pi}{2}$ (4) $-2n\pi$

where $n \in I$

- **58.** If $xy = e^{x-y}$, then $\frac{dy}{dx}$ is equal to:
 - (1) $\frac{(x-1)y}{x(1+y)}$ (2) $\frac{(x+1)y}{x(1+y)}$ (3) $\frac{(x-1)y}{x(1-y)}$
- (4) None of these

- **59.** If $y = \frac{1 + \sin x \cos x}{1 + \sin x + \cos x}$, then $\frac{dy}{dx}$ is equal to:
- (1) $\frac{1}{\cos r}$ (2) $\frac{1}{\sin r}$ (3) $\frac{1}{1-\cos r}$
- (4) None of these

60.	If A	$=\begin{bmatrix}1\\1\end{bmatrix}$	1	, then A^{100}	is equal to:
-----	------	-------------------------------------	---	------------------	--------------

- (1) 2100 A
- (2) 100 A
- (3) 299 A
- (4) 299 A

61. If f(x) = x + 2, then f'[f(x)] at x = 4 is:

- (1) 8
- (3) 4

62. The value of $\frac{d}{dx} \left[\left(\frac{\tan^2 2x - \tan^2 x}{1 - \tan^2 2x \tan^2 x} \right) \cot 3x \right]$ is:

- (1) $\sec x$ (2) $\sec^3 x$ (3) $\sec x \tan x$ (4) $\sec^2 x$

63. If $x = a \sin \theta$, $y = b \cos \theta$, then $\frac{d^2y}{dx^2}$ is equal to :

- (1) $\frac{b}{a^2} \sec \theta$ (2) $-\frac{b}{a^2} \sec^3 \theta$ (3) $\frac{b}{a} \sec^2 \theta$
- (4) None of these

64. If $x^m y^n = (x+y)^{m+n}$, then $\frac{dy}{dx}$ is:

- (1) $\frac{y}{x}$ (2) $\frac{x}{y}$
- (3) xy
- (4) None of these

Maximum slope of the curve $y = -x^3 + 3x^2 + 9x - 27$ is:

- (2) 16
- (3) 12
- (4) 32

The function x^x is increasing, when:

- (1) $x > \frac{1}{a}$ (2) $x < \frac{1}{a}$ (3) x < 0
- (4) None of these

67. The rate of change of the surface area of a sphere of radius r, when the radius is increasing at the rate of 2 cm/s is proportional to:

- (1) $\frac{1}{-}$
- (2) r^2
- (3) r
- $(4) \frac{1}{2}$

68. Angle between the tangents to the curve $y = x^2 - 5x + 6$ at the points (2, 0) and (3, 0) is:

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

69.
$$\int \frac{(x+1)^2}{x(x^2+1)} dx$$
 is equal to :

- (1) $\log x + C$ (2) $2 \tan^{-1} x + C$ (3) $\log \frac{1}{1 + x^2} + C$ (4) None of these

70.
$$\int \frac{x + \sin x}{1 + \cos x} dx$$
 is equal to:

- (1) $x \tan \frac{x}{2} + C$ (2) $\tan \frac{x}{2} + C$ (3) $\log \cos \frac{x}{2}$ (4) None of these

71. If
$$\vec{a} = \hat{i} + \hat{j} + \hat{k}$$
, $\vec{b} = 2\hat{i} - 4\hat{k}$, $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar, then the value of λ is:

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

72. If
$$\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}$$
 and $\vec{b} = 5\hat{i} - 3\hat{j} + \hat{k}$, then the projection of \vec{b} on \vec{a} is:

- (2) 5
- (3) 4

73. If
$$\vec{a}$$
, \vec{b} , \vec{c} are mutually perpendicular unit vectors, then $|\vec{a} + \vec{b} + \vec{c}|$ is equal to :

74. If
$$\vec{a} = \hat{i} + \hat{j} + \hat{k}$$
, $\vec{b} = \hat{i} + \hat{j}$, $\vec{c} = \hat{i}$ and $(\vec{a} \times \vec{b}) \times \vec{c} = \lambda \vec{a} + \mu \vec{b}$, then $\lambda + \mu$ is equal to:

75. A variable plane moves, so that the sum of the reciprocals of its intercepts on the coordinates axes is
$$\frac{1}{2}$$
. Then the plane passes through:

- (1) $\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$ (2) (-1, 1, 1) (3) (2, 2, 2)
- (4) (0,0,0)

(1) x+y+z-15=0

(2) x + y + z + 15 = 0

(3) x-y-z-15=0

(4) x - y + z - 15 = 0

77. The direction ratio of normal to the plane through
$$(1, 0, 0)$$
, $(0, 1, 0)$ which makes an angle $\frac{\pi}{4}$ with plane $x + y = 3$ are :

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

- A line makes the same angle θ , with each of the x and z axes. If the angle β which it makes with y-axis is such that $\sin^2 \beta = 3\sin^2 \theta$, then $\cos^2 \theta$ is equal to:
 - (1) $\frac{2}{5}$

- **79.** The solution of $\frac{dy}{dx} = 2^{y-x}$ is:

 - (1) $2^x + 2^y = C$ (2) $\frac{1}{2^x} \frac{1}{2^y} = C$ (3) $2^x 2^y = C$ (4) None of these

- 80. $y + x^2 = \frac{dy}{dx}$ has the solution:
 - (1) $y + x^2 + 2x + 2 = ce^x$
- $(2) \quad y + 2x = ce^x$

(3) $y + 2x + 2 = ce^x$

- (4) None of these
- 81. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ are :
 - (1) 99²
- (3) 299
- (4) 100
- 82. If $f(x) = 1 \frac{1}{x}$, then the value of $f\left(\frac{1}{x}\right)$ is:

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

- 83. The function $f(x) = \log(x + \sqrt{x^2 + 1})$ is:
 - (1) an even function

(2) an odd function

(3) a periodic function

- (4) none of these
- 84. The value of $\sin A \sin(60^\circ + A) \sin(60^\circ A)$ is equal to:

 - (1) $\sin 3A$ (2) $\sin \frac{3A}{2}$ (3) $\sin \frac{3A}{4}$
- (4) $\sin \frac{4A}{2}$
- **85.** If $\cos \theta = \frac{1}{2} \left(x + \frac{1}{x} \right)$, then $\frac{1}{2} \left(x^2 + \frac{1}{x^2} \right)$ is equal to :
 - (1) $\cos 2\theta$
- (2) sin 2θ
- (3) sec 20
- (4) tan 2θ

- **86.** If $y = \sin^2 \theta + \csc^2 \theta$, $\theta \neq 0$, then:
 - (1) y > 2
- (2) 1/≤2
- (3) $y \ge -2$
- (4) y = 0

27	7. The value of	cos 12° – sin 12°	sin 147°	is soved to
87.		cos 12° + sin 12°	cos 147°	is equal to :

- (1) 0
- (2) -1
- (3) 1
- (4) None of these

88.
$$P(n): 1+3+5+\ldots+(2n-1)=n^2$$
 is:

(1) true for n > 1

(2) true for no n

(3) true for all $n \in N$

(4) none of these

89. If eleven members of a committee sit at a round table so that the President and Cashier always sit together, then the number of arrangements is:

- (1) $|10 \times 2|$
- (2) |9×2
- (3) |10
- (4) None of these

90. In how many ways can 5 keys be put in a ring?

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

91. Five horses are in the race. Mr. B selects two of the horses at random and bets on them. The probability that Mr. B selected the winning horse, is:

- (4) None of these

If A and B are events such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$, $P(\overline{A}) = \frac{2}{3}$, then $P(\overline{A} \cap B)$

- (2) $\frac{3}{8}$ (3) $\frac{5}{8}$
- $(4) \frac{1}{4}$

A coin is tossed three times. The probability of getting head and tail alternatively, is:

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

Seven white balls and three black balls are randomly placed in a row. The probability that no two black balls are placed adjacently, equals:

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

The solution set of the equation $\sin^{-1} x = 2 \tan^{-1} x$ is:

- (1) {1, 2}
- (2) $\{-1,2\}$
- $(3) \{-1, 1, 0\}$
- (4) $\left\{1, \frac{1}{2}, 0\right\}$

96.
$$\tan \left[\frac{1}{2} \sin^{-1} \left(\frac{2a}{1+a^2} \right) + \frac{1}{2} \cos^{-1} \left(\frac{1-a^2}{1+a^2} \right) \right]$$
 is equal to:

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

97. $\tan^{-1} \frac{x}{y} - \tan^{-1} \frac{x-y}{x+y}$; (x > y > 0) is equal to:

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

98. If in a triangle ABC, $\underline{A} = \tan^{-1} 2$ and $\underline{B} = \tan^{-1} 3$, then angle C is equal to:

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

For real numbers x and y, we write $xRy \Leftrightarrow x^2 - y^2 + \sqrt{3}$ is an irrational number. Then the relation R, is:

- (1) Transitive
- (2) Reflexive
- (3) Symmetric
- (4) None of these

A function f from the set of natural numbers to integers defined by $f(x) = \begin{cases} \frac{n-1}{2} & \text{when } n \text{ is odd} \\ -\frac{n}{2} & \text{when } n \text{ is even} \end{cases}$

- (1) one-one but not onto
- (2) onto but not one-one
- (3) one-one and onto both
- (4) none of these

Vsed for Evaluation of ory R Sheets Total No. of Printed Pages: 13 (DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO) PG-EE-2016 SUBJECT: Mathematics Hons. Five Year

Time: 11/4 Hours Max. Marks: 100 Total Questions: 100 Roll No. (in figures) (in words) _ Father's Name ___ Mother's Name __ Date of Examination___ (Signature of the Candidate)

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- 2. The candidates must return the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
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PG-EE-2016/(Maths Hons Five Year)/(D)

1.	The solution of x	dy – y	$dx + x^2 e^x dx =$	0 is:			
	$(1) \frac{x}{y} + e^x = C$	(2)	$x + e^y = C$	(3)	$\frac{y}{x} + e^x = C$	(4)	$y + e^x = C$
2.	The algebraic sur observation is:						om 30 is 2. The mean
	(1) 28.5	(2)	29.6	(3)	30.5	(4)	30.1
3.	The standard de standard deviation			is 6 a	nd if each ite	em is	decreased by 1, then
	(1) 5	(2)	7	(3)	6	(4)	None of these
4.	If in a frequency its mode is approx	distrit ximate	oution, the me	an and	l median are	21 and	22 respectively, then
	(1) 24	(2)	42	(3)	22	(4)	20
5.	A coin is tossed 4	times.	The probabili	ity that	at least one h	ead tu	rns up is :
	(1) $\frac{1}{16}$				_		
6.	One card is draw king or spade is:	n rand	lomly from a	pack o	f 52 cards, the	n the	probability that it is a
	(1) $\frac{1}{13}$	(2)	13	(3)	3 13	(4)	4 13
7.							and their respective
	solved, is:					oabilit	y that the problem is
	(1) $\frac{1}{3}$	(2)	$\frac{1}{2}$	(3)	$\frac{3}{4}$	(4)	2 3
8.	Five coins whose 12 is:	faces	are marked 2,	3 are	tossed. The ch	ance (of obtaining a total of
	(1) $\frac{1}{32}$	(2)	$\frac{1}{16}$	(3)	$\frac{3}{16}$	(4)	<u>5</u>

(3) 16

9. A card is drawn from a pack of cards. The probability that the card will be a queen or a heart, is:

(2) $\frac{4}{13}$ (3) $\frac{3}{13}$

(4) None of these

- 10. If a dice is thrown twice, the probability of occurrence of 4 at least once, is:

- (4) None of these

- 11. $\int x^x(1+\log x) dx$ is equal to:
 - (1) $x^{2x} + C$ (2) $x^x + C$
- (3) $x^x \log x$
- (4) None of these

- 12. $\int \frac{x}{x^2 + 4x + 5} dx$ is equal to:
 - (1) $\frac{1}{2}\log[x^2+4x+5]-2\tan^{-1}(x+2)+C$
 - (2) $\frac{1}{2} \log[(x+2)^2 1] + 2 \tan^{-1}(x+2) + C$
 - (3) $\frac{1}{2}\log[x^2+4x+5]+C$
 - (4) None of these
 - $\int \frac{dx}{\sin x \cos x}$ is equal to:
 - (1) $\log |\sin x| + C$

(2) $\log |\sec x| + C$

(3) $\log |\tan x| + C$

- (4) None of these
- 14. $\int_{1}^{\frac{1}{2}} (\cos x) \left[\log \left(\frac{1-x}{1+x} \right) \right] dx$ is equal to:
- (2) $e^{\frac{1}{2}}$
- (3) 0
- (4) -1

- 15. $\int_{0}^{3} \frac{dx}{x^2 x}$ is equal to:
 - (1) $\log\left(\frac{2}{3}\right)$ (2) $\log\left(\frac{1}{4}\right)$ (3) $\log\left(\frac{8}{3}\right)$
- (4) $\log\left(\frac{4}{3}\right)$

- **16.** The value of $\int_{0}^{\pi} (1-x^2) \sin x \cos^2 x \, dx$ is:
 - (1) n
- (2) 0
- (3) 2π
- (4) None of these

- 17. The area bounded by $y = \log x$, x-axis and ordinates x = 1, x = 2 is:
 - (1) $\log\left(\frac{4}{a}\right)$ sq. unit

(2) $\log \left(\frac{2}{e}\right)$ sq. unit

(3) log 4 sq. unit

- (4) None of these
- Area bounded by the curves $y = x^2$ and $y^2 = x$ is:
 - (1) $\frac{2}{3}$ sq. unit (2) $\frac{1}{3}$ sq. unit (3) $\frac{1}{2}$ sq. unit (4) None of these

- Area of region satisfying $x \le 2$, $y \le |x|$ and $x \ge 0$ is:
 - (1) 4 sq. unit
- (2) 1 sq. unit
- (3) 2 sq. unit
- (4) None of these

- 20. $\int \frac{dx}{x^2 + 4x + 13}$ is equal to:
 - (1) $\tan^{-1}\left(\frac{x+2}{3}\right) + C$

(2) $\frac{1}{3} \tan^{-1} \frac{x}{2} + C$

(3) $\tan^{-1}(x-2)+C$

- (4) None of these
- **21.** If A is a square matrix, then (A + A') is:
 - (1) unit matrix

(2) symmetric matrix

(3) non-singular matrix

- (4) skew-symmetric matrix
- **22.** If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then value of α for which $A^2 = B$ is:
 - (1) 1
- (2) -1
- (3) 4
- (4) no real value
- 23. If $A = \begin{bmatrix} 0 & 3 \\ 2 & 0 \end{bmatrix}$ and $A^{-1} = \lambda(\text{adj } A)$, then λ is equal to:
- (2) $\frac{1}{6}$ (3) $\frac{1}{3}$
- $(4) -\frac{1}{2}$
- **24.** If A is a square matrix such that AA' = I = A'A, then |A| is equal to:
 - (1) 0
- (2) ±2
- $(3) \pm 1$
- (4) None of these
- **25.** If w is a complex cube root of unity, then $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is equal to:
 - (1) 1
- (2) w
- (3) 0
- $(4) w^2$

- **26.** If $C = 2 \cos \theta$, then the value of the determinant $\Delta = \begin{bmatrix} 1 & C & 1 \end{bmatrix}$ is:

(2) $4\cos^2\theta(2\cos\theta - 1)$

 $(3) \frac{2\sin^2 2\theta}{\sin \theta}$

- (4) None of these
- 27. x + ky z = 0, 3x ky z = 0 and x 3y + z = 0 has non-zero solution for k is equal to :
- (2) 1
- (3) -1
- (4) None of these

- **28.** If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$, then A^{-1} is equal to:
- (1) $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (2) $\begin{bmatrix} -\frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & \frac{1}{11} \end{bmatrix}$ (3) $\begin{bmatrix} \frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (4) None of these

- **29.** If $A = \begin{bmatrix} 1 & \log_b^a \\ \log_b^b & 1 \end{bmatrix}$, then |A| is equal to:

 - (1) 0 (2) 1
- (3) log n
- (4) \log^b
- **30.** If $y = \sqrt{\sin x + \sqrt{\sin x + \sqrt{\sin x + \dots + \infty}}}$, then $\frac{dy}{dx}$ is equal to:
 - (1) $-\frac{\cos x}{2\nu 1}$ (2) $\frac{\sin x}{1 2\nu}$ (3) $\frac{\cos x}{2\nu 1}$
- (4) None of these
- 31. A lady gives a dinner party for six guests. The number of ways in which they may be selected from among ten friends, if two of the friends will not attend the party together, is:
 - (1) 164
- (2) 140
- (3) 112
- (4) 40
- If w is an imaginary cube root of unity, then $(1+w-w^2)$ is equal to:
 - (1) 128 w.
- (2) -128 w (3) $-128 w^2$
- $(4) 128 w^2$
- The equation $z\bar{z} + (2-3i)z + (2+3i)\bar{z} + 4 = 0$ represents a circle of radius:
 - (1) 3
- (2) 4
- (3) 2
- (4) 6

					5
34.	If the roots of the roots of the equation	equation $qx^2 + px + q$ on $x^2 - 4qx + p^2 = 0$	η = 0 a are:	are complex, w	there p, q are real; then the
	(1) real and equal (3) real and unequ		(2)	imaginary none of these	
35.	If $a + b = 8$, then ab (1) $a = 3$, $b = 5$	is greatest when: (2) $a = 4, b = 4$	(3)	a = 6, b = 2	(4) None of these
36.	If the coefficient o	f 7th and 13th term	in the	expansion of	$(1+x)^n$ are equal, then n is
	(1) 10	(2) 20	(3)	15	(4) 18
37.		e number of combine ${}^{n}c_{r-1} + 2 \times {}^{n}c_{r}$ equals		s of n things	taken r at a time, then the
	(1) $^{n+2}c_r$	(2) $^{n+2}c_{r+1}$	(3)		
38.	The number which	ch should be added in G. P. is:	to th	e numbers 2,	14, 62, so that the resulting
	(1) 4	(2) 3	(3)	2	(4) 1
39.		e equation $x^3 - 12x^2$	+39x	-28 = 0 are in	n A. P., then their common
	(1) ±2	(2) ±4	(3)	±1	(4) ±3
40.	The same of the sa	the straight line joing $y + 2x - 2 = 0$ is:			the point of intersection of
	(1) $3x + 4y = 0$	(2) $4x + 3y = 0$	(3)	3x - 4y = 0	$(4) \ 4x - 3y = 0$
41	Let R be the relation then R^{-1} is equal	ation from $A = \{2, 3, 1\}$ to:	4, 5]	to $B = \{3, 6, 7,$	10) defined by 'x divides y',
	(1) {(6, 2), (3, 3)}		(2) ((6, 2), (10, 2)}
	(3) ((6, 2), (10, 2)), (3, 3), (6, 3), (10, 5)}	(4) None of the	se
42	. Which of the foll	owing is a singleton	set?		
	(1) $ x: x < 1, x$		(2	(x: x = 5,	
	(3) $\{x: x^2 = 1, x\}$	€ Z)	(4	$(x: x^2 + x +$	$1=0,x\in R\}$

- **43.** If $A = \{(x, y) : y = e^x, x \in R\}$ and $B = \{(x, y) : y = e^{-x}, x \in R\}$, then $A \cap B$ is :
 - (1) empty set
- (2) not a set
- (3) singleton set
- (4) none of these
- **44.** If $A = \{(x,y): x^2 + y^2 = 25\}$ and $B = \{(x,y): x^2 + 9y^2 = 144\}$, then $A \cap B$ contains:
 - (1) one point
- (2) two points
- (3) three points
- (4) four points

- **45.** If $z = i \log (2 \sqrt{3})$, then $\cos z$ is equal to:
 - (1) i
- (2) 2
- (3) 3i
- (4) 2i

- **46.** The expression $\tan^2 \alpha + \cot^2 \alpha$ is:
 - $(1) \ge 2$
- $(3) \ge -2$
- (4) None of these
- 47. A linear programming problem is concerned with finding the following value:
 - (1) only maximum value
- (2) optimal value
- (3) only minimum value
- (4) none of these
- **48.** The linear function Z = ax + by, where a, b are constants, which has to be maximized or minimized is called a:
 - (1) constraint

- (2) function of any type
- (3) linear objective function
- (4) none of these
- 49. A compound statement is a statement which is made up of:
 - (1) only one statement

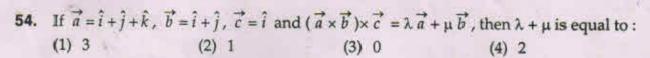
- (2) any number of statements
- (3) two or more statements
- (4) none of these
- 50. A compound statement with an 'Or' is false when:
 - (1) one component statement is false
 - (2) none component statement is false
 - (3) both the component statements are false
 - (4) none of these
- **51.** If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} 4\hat{k}$, $\vec{c} = \hat{i} + \lambda\hat{j} + 3\hat{k}$ are coplanar, then the value of λ is:
- (2) $\frac{3}{5}$ (3) $\frac{5}{2}$

s equal to:

(4) 0

52.	If $\vec{a} = 2\hat{i} + \hat{j}$	$+2\hat{k}$ and $\vec{b}'=5\hat{i}-3\hat{j}+$	\hat{k} , then the projecti	on of \vec{b} on \vec{a} is:
	(1) 6	(2) 5	(3) 4	(4) 3
53.	If \vec{a} , \vec{b} , \vec{c}	are mutually perpend	icular unit vectors,	then $ \vec{a} + \vec{b} + \vec{c} $ i
	(1) 3	(2) √3	(3) 1	(4) 0

(2) √3



A variable plane moves, so that the sum of the reciprocals of its intercepts on the coordinates axes is $\frac{1}{2}$. Then the plane passes through:

(3) 1

(1)
$$\left(\frac{1}{2}, \frac{1}{2}, \frac{1}{2}\right)$$
 (2) $(-1, 1, 1)$ (3) $(2, 2, 2)$ (4) $(0, 0, 0)$

The equation of the plane which bisects the line joining (2, 3, 4) and (6, 7, 8) is:

(1)
$$x + y + z - 15 = 0$$

(2) $x + y + z + 15 = 0$
(3) $x - y - z - 15 = 0$
(4) $x - y + z - 15 = 0$

57. The direction ratio of normal to the plane through (1, 0, 0), (0, 1, 0) which makes an angle $\frac{\pi}{4}$ with plane x + y = 3 are:

(1)
$$1, \sqrt{2}, 1$$
 (2) $1, 1, \sqrt{2}$ (3) $1, 1, 2$ (4) $\sqrt{2}, 1, 1$

58. A line makes the same angle θ , with each of the x and z axes. If the angle β which it makes with y-axis is such that $\sin^2 \beta = 3\sin^2 \theta$, then $\cos^2 \theta$ is equal to:

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

59. The solution of $\frac{dy}{dx} = 2^{y-x}$ is:

(1)
$$2^x + 2^y = C$$
 (2) $\frac{1}{2^x} - \frac{1}{2^y} = C$ (3) $2^x - 2^y = C$ (4) None of these

60. $y + x^2 = \frac{dy}{dx}$ has the solution:

(1)
$$y + x^2 + 2x + 2 = ce^x$$
 (2) $y + 2x = ce^x$ (3) $y + 2x + 2 = ce^x$ (4) None of these

- Five horses are in the race. Mr. B selects two of the horses at random and bets on them. The probability that Mr. B selected the winning horse, is:

- (4) None of these
- **62.** If A and B are events such that $P(A \cup B) = \frac{3}{4}$, $P(A \cap B) = \frac{1}{4}$, $P(\overline{A}) = \frac{2}{3}$, then $P(\overline{A} \cap B)$ is:
 - $(1) \frac{5}{10}$
- (2) $\frac{3}{7}$
- (3) $\frac{5}{3}$
- $(4) \frac{1}{4}$
- A coin is tossed three times. The probability of getting head and tail alternatively, is :
- $(2) \frac{1}{2}$
- (3) $\frac{1}{4}$
- (4) None of these
- Seven white balls and three black balls are randomly placed in a row. The probability that no two black balls are placed adjacently, equals:
- $(2) \frac{2}{15}$
- $(3) \frac{7}{15}$
- $(4) \frac{1}{2}$
- The solution set of the equation $\sin^{-1} x = 2 \tan^{-1} x$ is:
 - (1) $\{1, 2\}$
- (2) {-1, 2}
- (3) $\{-1, 1, 0\}$ (4) $\{1, \frac{1}{2}, 0\}$
- **66.** $\tan \left[\frac{1}{2} \sin^{-1} \left(\frac{2a}{1+a^2} \right) + \frac{1}{2} \cos^{-1} \left(\frac{1-a^2}{1+a^2} \right) \right]$ is equal to:
 - (1) $\frac{2a}{1+a^2}$ (2) $\frac{2a}{1-a^2}$ (3) $\frac{1-a^2}{1+a^2}$
- (4) $\frac{1+a^2}{1-a^2}$

- 67. $\tan^{-1} \frac{x}{y} \tan^{-1} \frac{x-y}{x+y}$; (x > y > 0) is equal to:
- (2) $-\frac{\pi}{4}$ (3) $-\frac{3\pi}{4}$
- $(4) \frac{\pi}{4}$
- If in a triangle ABC, $A = \tan^{-1} 2$ and $B = \tan^{-1} 3$, then angle C is equal to:
- (2) $\frac{3\pi}{4}$ (3) $-\frac{\pi}{4}$
- (4) None of these

- **69.** For real numbers x and y, we write $xRy \Leftrightarrow x^2 y^2 + \sqrt{3}$ is an irrational number. Then the relation R, is:
 - (1) Transitive

- (2) Reflexive (3) Symmetric (4) None of these
- A function f from the set of natural numbers to integers defined by $f(x) = \begin{cases} \frac{n-1}{2} & \text{, when } n \text{ is odd} \\ -\frac{n}{2} & \text{, when } n \text{ is even} \end{cases}$
 - (1) one-one but not onto
- (2) onto but not one-one
- (3) one-one and onto both
- (4) none of these
- 71. If two sets A and B are having 99 elements in common, then the number of elements common to each of the sets $A \times B$ and $B \times A$ are:
 - (1) 99^2
- (2) 18
- $(3) 2^{99}$
- (4) 100
- 72. If $f(x) = 1 \frac{1}{x}$, then the value of $f\left(\frac{1}{x}\right)$ is:
 - (1) $\frac{1}{x} 1$ (2) $\frac{x}{1 x}$ (3) $\frac{x 1}{x}$ (4) $\frac{x}{x 1}$

- **73.** The function $f(x) = \log(x + \sqrt{x^2 + 1})$ is:
 - (1) an even function

(2) an odd function

(3) a periodic function

- (4) none of these
- 74. The value of $\sin A \sin(60^\circ + A) \sin(60^\circ A)$ is equal to:

- (2) $\sin \frac{3A}{2}$ (3) $\sin \frac{3A}{4}$ (4) $\sin \frac{4A}{3}$
- **75.** If $\cos \theta = \frac{1}{2} \left(x + \frac{1}{x} \right)$, then $\frac{1}{2} \left(x^2 + \frac{1}{x^2} \right)$ is equal to :

 - (1) $\cos 2\theta$ (2) $\sin 2\theta$
- (3) sec 2θ
- (4) tan 20

- **76.** If $y = \sin^2 \theta + \csc^2 \theta$, $\theta \neq 0$, then:
 - (1) y > 2
- (2) $y \le 2$
- (3) $y \ge -2$
- $(4) \ \ y = 0$

(4) None of these

(4) None of these

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77.	The value of	cos 12° – sir	12° sin 147	is equal to:
	The value of	cos 12°+sir	112° cos 147	is equal to.
	(1) 0	(2)	-1	(3) 1
78.	P(n): 1 + 3 +	5 ++	$(2n-1)=n^2$	is:
	(1) true for t	i > 1		(2) true for
100				

(3) true for all $n \in N$

(1) $|10 \times 2|$

79. If eleven members of a committee sit at a round table so that the President and Cashier always sit together, then the number of arrangements is:

(3) |10

no n

(4) none of these

80. In how many ways can 5 keys be put in a ring?

(2) 19×2

- (1) $\frac{5}{2}$ (2) $\frac{5}{2}$ (3) $\frac{4}{2}$ (4) $\frac{4}{2}$
- 81. The straight line whose sum of the intercepts on the axes is equal to half of the product of the intercepts, passes through the point:
 - (1) (2, 2) (2) (1, 1) (3) (4, 4) (4) (3, 3)
- **82.** The equation of a circle with centre (1, 2) and tangent x + y 5 = 0 is:
 - (1) $x^2 + y^2 + 2x 4y + 6 = 0$ (2) $x^2 + y^2 - 2x - 4y + 3 = 0$ (3) $x^2 + y^2 - 2x + 4y + 8 = 0$ (4) $x^2 + y^2 - 2x - 4y + 8 = 0$
- 83. The distance between the foci of an ellipse is 16 and the eccentricity is $\frac{1}{2}$. Length of major axis of the ellipse is:
- (1) 8 (2) 16 (3) 32 (4) 64
- 84. The ratio in which the line joining (2, 4, 5) and (3, 5, -4) is divided by the yz-plane is:
 - (1) 4:-3 (2) 3:2 (3) 2:3 (4) -2:3
- **85.** A plane makes intercepts 3 and 4 respectively on z-axis and x-axis. If plane is parallel to y-axis, then its equation is:
 - (1) 3z + 4x = 12 (2) 3y + 4z = 12 (3) 3x + 4z = 12 (4) 3z + 4y = 12

86.
$$\lim_{x\to 0} \frac{\int_0^x y \, dy}{x \tan(\pi + x)}$$
 is equal to:

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

- The points of discontinuity of $\tan x$ are:
 - (1) $x = n\pi$
- (2) $2n\pi$
- (3) $(2n+1)\frac{\pi}{2}$ (4) $-2n\pi$

where $n \in I$

- **88.** If $xy = e^{x-y}$, then $\frac{dy}{dx}$ is equal to:
 - (1) $\frac{(x-1)y}{x(1+y)}$ (2) $\frac{(x+1)y}{x(1+y)}$ (3) $\frac{(x-1)y}{x(1-y)}$
- (4) None of these

- 89. If $y = \frac{1 + \sin x \cos x}{1 + \sin x + \cos x}$, then $\frac{dy}{dx}$ is equal to:
- (1) $\frac{1}{\cos x}$ (2) $\frac{1}{\sin x}$ (3) $\frac{1}{1-\cos x}$
- (4) None of these

- **90.** If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then A^{100} is equal to:
 - (1) 2100 A
- (2) 100 A
- (3) 299 A
- (4) 299 A

- **91.** If f(x) = x + 2, then f'[f(x)] at x = 4 is:

- (4) 5
- 92. The value of $\frac{d}{dx} \left[\left(\frac{\tan^2 2x \tan^2 x}{1 \tan^2 2x \tan^2 x} \right) \cot 3x \right]$ is:
- (2) $\sec^3 x$
- (3) $\sec x \tan x$ (4) $\sec^2 x$
- 93. If $x = a \sin \theta$, $y = b \cos \theta$, then $\frac{d^2y}{dx^2}$ is equal to:

 - (1) $\frac{b}{a^2} \sec \theta$ (2) $-\frac{b}{a^2} \sec^3 \theta$ (3) $\frac{b}{a} \sec^2 \theta$
- (4) None of these

94. If
$$x^m y^n = (x + y)^{m+n}$$
, then $\frac{dy}{dx}$ is:

- (1) $\frac{y}{x}$ (2) $\frac{x}{y}$
- (3) xy
- (4) None of these

95. Maximum slope of the curve
$$y = -x^3 + 3x^2 + 9x - 27$$
 is:

- (2) 16
- (4) 32

96. The function
$$x^x$$
 is increasing, when:

- (2) $x < \frac{1}{x}$
- (3) x < 0
- (4) None of these

The rate of change of the surface area of a sphere of radius r, when the radius is increasing at the rate of 2 cm/s is proportional to:

- (2) r²
- $(4) \frac{1}{2}$

98. Angle between the tangents to the curve
$$y = x^2 - 5x + 6$$
 at the points (2, 0) and (3, 0) is:

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

99.
$$\int \frac{(x+1)^2}{x(x^2+1)} dx$$
 is equal to :

- (1) $\log x + C$ (2) $2 \tan^{-1} x + C$ (3) $\log \frac{1}{1 + r^2} + C$ (4) None of these

100.
$$\int \frac{x + \sin x}{1 + \cos x} dx$$
 is equal to:

- (1) $x \tan \frac{x}{2} + C$ (2) $\tan \frac{x}{2} + C$ (3) $\log \cos \frac{x}{2}$ (4) None of these

1.	1	16. 4	31. 2	46. 1	61. 1	76. 4	91. 3
2.	4	17. 2	32. 4	47. 3	62. 4	77. 3	92. 1
3.	2	18. 3	33. 1	48. 2	63. 2	78. 4	93. 3
4.	3	19. 4	34. 3	49. 4	64. 3	79. 2	94. 4
5.	1	20. 2	35. 3	50. 1	65. 3	80. 1	95. 2
6.	1	21. 1	36, 4	51. 2	66. 1	81. 2	96. 1
7.	1	22. 2	37. 2	52. 1	67. 2	82. 1	97. 2
8,	3	23. 3	38. 1	53. 3	68. 4	83. 3	98. 3
9.	2	24. 4	39. 1	54. 3	69. 2	84. 3	99. 3
10.	4	25. 3	40. 3	55. 4	70. 1	85. 3	100, 3
11.	2	26. 2	41. 2	56. 2	71. 3	86. 2	
12.	3	27. 3	42. 4	57. 1	72. 4	87. 4	
13.	1	28. 1	43. 2	58. 2	73. 3	88. 1	
14.	3	29. 4	44. 1	59. 3	74. 1	89. 2	
15.	2	30. 3	45. 3	60. 4	75. 2	90. 3	

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	3.	1	18.	3	33.	3	48.	1	63.	2	78.	4	93. 3	
	4.	3	19.	3	34.	3	49.	1	64.	1	79.	2	94. 3	
	5.	2	20.	3	35.	4	50.	3	65.	3	80.	1	95. 3	
	6.	4	21.	3	36.	2	51.	1	66.	1	81.	1	96. 2	
	7.	2	22.	4	37.	1	52.	2	67.	3	82.	4	97. 4	
	8.	3	23.	3	38.	2	53.	3	68.	2	83.	2	98. 1	
	9.	4	24.	1	39.	3	54.	4	69.	4	84.	3	99, 2	
	10.	2	25.	2	40.	4	55.	3	70.	1	85.	1	100. 3	
	11.	3	26.	4	41.	2	56.	2	71.	1	86.	1		
	12.	1	27.	3	42.	4	57.	3	72.	4	87.	1		
	13.	3	28.	4	43.	1	58.	1	73.	2	88.	3		
	14.	4	29.	2	44.	3	59.	4	74.	3	89.	2		
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2.	4	17.1	32. 3	47. 2	62. 1	77. 1	92, 4
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15.	4	30. 3	45. 2	60. 1	75. 1	90. 3	

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