



JSPM's

Imperial College of Engineering and Research, Wagholi, Pune.

(Approved by AICTE, Delhi & Govt. of Maharashtra, affiliated to SPPU)

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DTE Code- 6160

Bachelor of Engineering (B.E)

Sr. No	U.G Courses	Intake
1.	Civil Engineering (Morning Shift)	120
2.	Civil Engineering (Afternoon Shift)	60
3.	Computer Engineering	60
4.	E&TC Engineering	120
5.	Mechanical Engineering (Morning Shift)	120
6.	Mechanical Engineering (Afternoon Shift)	120

Admissions Open For First Year /Direct second Year Engineering /MBA/ME for A.Y. 2020-21

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MHT- CET 2018 Question Paper Subject :- Mathematics



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Mathematics

Single Correct Questions +2 | -0

1. $\int_0^{\pi/4} x \cdot \sec^2 x \, dx =$
(A) $\frac{\pi}{4} + \log \sqrt{2}$
(B) $\frac{\pi}{4} - \log \sqrt{2}$
(C) $1 + \log \sqrt{2}$
(D) $1 - \frac{1}{2} \log 2$
2. In $\triangle ABC$, with usual notations, if a,b,c are in A.P. then $a \cos^2 \left(\frac{C}{2}\right) + c \cos^2 \left(\frac{A}{2}\right) =$
(A) $3\frac{a}{2}$
(B) $3\frac{c}{2}$
(C) $3\frac{b}{2}$
(D) $\frac{3abc}{2}$
3. If $X = e^\theta (\sin \theta - \cos \theta)$, $y = e^\theta (\sin \theta + \cos \theta)$ then $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$ is
(A) 1
(B) 0
(C) $\frac{1}{\sqrt{2}}$
(D) $\sqrt{2}$
4. The number of solutions of $\sin x + \sin 3x + \sin 5x = 0$ in the interval $\left[\frac{\pi}{2}, 3\frac{\pi}{2}\right]$ is
(A) 2
(B) 3
(C) 4
(D) 5



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5. If $\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$ then
- (A) $\frac{1}{6}$
- (B) $\frac{1}{5}$
- (C) $\frac{1}{6}$
- (D) $\frac{1}{2}$
6. Matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ then the value of $a_{31}A_{31} + a_{32}A_{32} + a_{33}A_{33}$ is
- (A) 1
- (B) 13
- (C) -1
- (D) -13
7. The contrapositive of the statement : "If the weather is fine then my friends will come and we go for a picnic."
- (A) The weather is fine but my friends will not come or we do not go for a picnic.
- (B) If my friends do not come or we do not go for picnic then weather will not be fine.
- (C) If the weather is not fine then my friends will not come or we do not go for a picnic.
- (D) The weather is not fine but my friends will come and we go for a picnic.
8. If $f(x) = \frac{x}{x^2 + 1}$ is increasing function on then the value of x lies in
- (A) R
- (B) $(-\infty, -1)$
- (C) $(1, \infty)$
- (D) $(-1, 1)$
9. If $X = (4^n - 3n - 1 : n \in N)$ and $Y = \{9(n - 1) : n \in N\}$, then $X \cap Y =$
- (A) X
- (B) Y
- (C) \emptyset
- (D) $\{0\}$

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10. The statement pattern $p \wedge (\sim p \wedge q)$ is
- (A) a tautology
 - (B) a contradiction
 - (C) equivalent to $p \wedge q$
 - (D) equivalent to $p \vee q$
11. If $\int_0^k \frac{dx}{2+18x^2} = \frac{\pi}{24}$, then the value of k is
- (A) 3
 - (B) 4
 - (C) $\frac{1}{3}$
 - (D) $\frac{1}{4}$
12. The cartesian co-ordinates of the point on the parabola $y^2 = -16x$, whose parameter is $\frac{1}{2}$ are
- (A) $(-2, 4)$
 - (B) $(4, -1)$
 - (C) $(-1, -4)$
 - (D) $(-1, 4)$
13. $\int \frac{1}{\sin x \cdot \cos^2 x} dx =$
- (A) $\sec x + \log |\sec x + \tan x| + c$
 - (B) $\sec x \cdot \tan x + c$
 - (C) $\sec x + \log |\sec x - \tan x| + c$
 - (D) $\sec x + \log |\operatorname{cosec} x - \cot x| + c$

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14. If $\log_{10} \left(\frac{x^3 - y^3}{x^3 + y^3} \right) = 2$ then $\frac{dy}{dx} =$

(A) $\frac{x}{y}$

(B) $-\frac{y}{x}$

(C) $-\frac{x}{y}$

(D) $\frac{y}{x}$

15. If $f : R - \{2\} \rightarrow R$ is a function defined by $f(x) = \frac{x^2 - 4}{x - 2}$, then range is

(A) R

(B) $R - \{2\}$

(C) $R - \{4\}$

(D) $R - \{-2, 2\}$

16. If planes $\vec{r} \cdot (p\hat{i} - \hat{j} + 2\hat{k}) + 3 = 0$ and $\vec{r} \cdot (2\hat{i} - p\hat{j} - \hat{k}) - 5 = 0$ include angle $\frac{\pi}{3}$ then the value of p is

(A) 1, -3

(B) -1, 3

(C) -3

(D) 3

17. The order of the differential equation of all parabolas, whose latus rectum is $4a$ and axis parallel to the x -axis, is

(A) One

(B) Four

(C) Three

(D) Two

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18. If lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $\frac{y-k}{2} = z$ intersect the the value of k is
- (A) $\frac{9}{2}$
(B) $\frac{1}{2}$
(C) $\frac{5}{2}$
(D) $\frac{7}{2}$
19. If a line makes angles 120° and 60° with the positive directions of X and Z axes respectively then the angle made by the line with positive Y - axis is
- (A) 150°
(B) 60°
(C) 135°
(D) 120°
20. L and M are two points with position vectors $2\bar{a} - \bar{b}$ and $\bar{a} + 2\bar{b}$ respectively. The position vector of the point N which divides the line segment LM in the ratio 2 : 1 externally is
- (A) $3\bar{b}$
(B) $4\bar{b}$
(C) $5\bar{b}$
(D) $3\bar{a} + 4\bar{b}$
21. $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \dots \cos 179^\circ =$
- (A) 0
(B) 1
(C) $-\frac{1}{2}$
(D) -1
22. If planes $x - cy - bz = 0$, $cx - y + az = 0$ pass through a straight line then $a^2 + b^2 + c^2 =$
- (A) $1 - abc$
(B) $abc - 1$
(C) $1 - 2abc$
(D) $2abc - 1$

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23. The point of intersection of lines represented by $x^2 - y^2 + x + 3y - 2 = 0$ is
- (A) $(1, 0)$
(B) $(0, 2)$
(C) $\left(-\frac{1}{2}, \frac{3}{2}\right)$
(D) $\left(\frac{1}{2}, \frac{1}{2}\right)$
24. A die is rolled. If X denotes the number of positive divisors of the outcome then the range of the random variable X is
- (A) $\{1, 2, 3\}$
(B) $\{1, 2, 3, 4\}$
(C) $\{1, 2, 3, 4, 5, 6\}$
(D) $\{1, 3, 5\}$
25. A die is thrown four times. The probability of getting perfect square in at least one throw is
- (A) $\frac{16}{81}$
(B) $\frac{65}{81}$
(C) $\frac{23}{81}$
(D) $\frac{58}{81}$
26. If the line $y = 4x - 5$ touches to the curve $y^2 = ax^3 + b$ at the point $(2, 3)$ then $7a + 2b =$
- (A) 0
(B) 1
(C) -1
(D) 2
27. The sides of a rectangle are given by $x = \pm a$ and $y = \pm b$. Then equation of the circle passing through the vertices of the rectangle is
- (A) $x^2 + y^2 = a^2$
(B) $x^2 + y^2 = a^2 + b^2$
(C) $x^2 + y^2 = a^2 - b^2$
(D) $(x - a)^2 + (y - b^2) = a^2 + b^2$

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28. The minimum value of the function $f(x) = x \log x$ is
- (A) $-\frac{1}{e}$
(B) $-e$
(C) $\frac{1}{e}$
(D) e
29. If $X \sim B(n, p)$ with $n = 10, p = 0.4$ then $E(X^2) =$
- (A) 4
(B) 2.4
(C) 3.6
(D) 18.4
30. The general solution of differential equation $\frac{dx}{dy} = \cos(x + y)$ is
- (A) $\tan\left(\frac{x + y}{2}\right) = y + c$
(B) $\tan\left(\frac{x + y}{2}\right) = x + c$
(C) $\cot\left(\frac{x + y}{2}\right) = y + c$
(D) $\cot\left(\frac{x + y}{2}\right) = x + c$
31. Letters in the word *HULULULU* are rearranged. The probability of all three L being together is
- (A) $\frac{3}{20}$
(B) $\frac{2}{5}$
(C) $\frac{3}{28}$
(D) $\frac{5}{23}$

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32. The sum of the first 10 terms of the series $9 + 99 + 999 + \dots$ is
- (A) $\frac{9}{8}(9^{10} - 1)$
(B) $\frac{100}{9}(10^9 - 1)$
(C) $10^9 - 1$
(D) $\frac{100}{9}(10^{10} - 1)$
33. If A, B, C are the angle of $\triangle ABC$ then $\cot A \cdot \cot B + \cot B \cdot \cot C \cdot \cot A =$
- (A) 0
(B) 1
(C) 2
(D) -1
34. If $\frac{dx}{\sqrt{16 - 9x^2}} = A \sin^{-1}(Bx) + C$ then $A + B =$
- (A) $\frac{9}{4}$
(B) $\frac{19}{4}$
(C) $\frac{3}{4}$
(D) $\frac{13}{12}$
35. $\int e^x \left[\frac{2 + \sin 2x}{1 + \cos 2x} \right] dx =$
- (A) $e^x \tan x + C$
(B) $e^x + \tan x + C$
(C) $2e^x \tan x + C$
(D) $e^x \tan 2x + C$
36. If $\vec{a}, \vec{b}, \vec{c}$ are mutually perpendic 1, 2, 3 $[\vec{a} + \vec{b} + \vec{c} \quad \vec{b} - \vec{a} \quad \vec{c}] =$
- (A) 0
(B) 6
(C) 12
(D) 18

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37. If points $P(4, 5, x)$, $Q(3, y, 4)$ and $R(5, 8, 0)$ are collinear, then the value of $x + y$ is
(A) -4
(B) 3
(C) 5
(D) 4
38. If the slope of one of the lines given by $ax^2 + 2hxy + by^2 = 0$ is two times the other then
(A) $8h^2 = 9ab$
(B) $8h^2 = 9ab^2$
(C) $8h = 9ab$
(D) $8h = 9ab^2$
39. The equation of the line passing through the point $(-3, 1)$ and bisecting the angle between co-ordinate axes is
(A) $x + y + 2 = 0$
(B) $-x + y + 2 = 0$
(C) $x - y + 4 = 0$
(D) $2x + y + 5 = 0$
40. The negation of the statement : "Getting above 95% marks is necessary condition for Hema to get the admission in good college".
(A) Hema gets above 95% marks but she does not get the admission condition for Hema to get the admission in good college."
(B) Hema does not get above 95% marks and she gets admission in good college
(C) If Hema does not get above 95% marks then she will not get the admission in good college.
(D) Hema does not get above 95% marks or she gets the admission in good college.
41. If $f(x) = x^2 + \alpha$ for $x \geq 0$
 $= 2\sqrt{x^2 + 1} + \beta$ for $x < 0$
is continuous at $x = 0$ and $f\left(\frac{1}{2}\right) = 2$ then $\alpha^2 + \beta^2$ is
(A) 3
(B) $\frac{8}{25}$
(C) $\frac{25}{8}$
(D) $\frac{1}{3}$

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42. If $y = (\tan^{-1} x)^2$ then $(x^2 + 1)^2 \frac{d^2y}{dx^2} + 2x(x^2 + 1) \frac{dy}{dx} =$
- (A) 4
(B) 2
(C) 1
(D) 0
43. The line $5x + y - 1 = 0$ coincides with one of the lines given by $5x^2 + xy - kx - 2y + 2 = 0$ then the value of k is
- (A) -11
(B) 31
(C) 11
(D) -31
44. If $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ then $(A^2 - 5A)A^{-1} =$
- (A) $\begin{bmatrix} 4 & 2 & 3 \\ -1 & 4 & 2 \\ 1 & 2 & 1 \end{bmatrix}$
(B) $\begin{bmatrix} -4 & 2 & 3 \\ -1 & -4 & 2 \\ 1 & 2 & -1 \end{bmatrix}$
(C) $\begin{bmatrix} -4 & -1 & 1 \\ 2 & -4 & 2 \\ 3 & 2 & -1 \end{bmatrix}$
(D) $\begin{bmatrix} -1 & -2 & 1 \\ 4 & -2 & -3 \\ 1 & 4 & -2 \end{bmatrix}$
45. The equation of line passing through $(-3, 1, 2)$ and perpendicular to the lines $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k})$ and $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + \lambda(2\hat{i} - 2\hat{j} + \hat{k})$ is
- (A) $\frac{x+3}{2} = \frac{y+1}{3} = \frac{z-2}{2}$
(B) $\frac{x-3}{3} = \frac{y+1}{2} = \frac{z-2}{2}$
(C) $\frac{x-3}{2} = \frac{y+1}{3} = \frac{z-2}{2}$
(D) $\frac{x-3}{2} = \frac{y+1}{2} = \frac{z-2}{3}$

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46. A coin is tossed three times. If X denotes the absolute difference between the number of heads and the number of tails then $P(X = 1) =$
- (A) $\frac{1}{2}$
(B) $\frac{2}{3}$
(C) $\frac{1}{6}$
(D) $\frac{3}{4}$
47. If $2 \sin\left(\theta + \frac{\pi}{3}\right) = \cos\left(\theta - \frac{\pi}{6}\right)$, then $\tan \theta =$
- (A) $\sqrt{3}$
(B) $-\frac{1}{\sqrt{3}}$
(C) $\frac{1}{\sqrt{3}}$
(D) $-\sqrt{3}$
48. The area of the region bounded by $x^2 = 4y$, $y = 1$, $y = 4$ and the y-axis lying in the first quadrant is _____ square units.
- (A) $\frac{22}{3}$
(B) $\frac{28}{3}$
(C) 30
(D) $\frac{21}{4}$
49. If $f(x) = \frac{e^{x^2} - \cos x}{x^2}$, for $x \neq 0$ is continuous at $x = 0$, then value of $f(0)$ is
- (A) $\frac{2}{3}$
(B) $\frac{5}{2}$
(C) 1
(D) $\frac{3}{2}$

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50. The maximum value of $2x + y$ subject to $3x + 5y \leq 26$ and $5x + 3y \leq 30, x \geq 0, y \geq 0$ is
- (A) 12
 - (B) 11.5
 - (C) 10
 - (D) 17.33

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