MAHARASHTRA BOARD · CLASS 12 · MATHEMATICS AND STATISTICS

Maharashtra Board Class 12 Mathematics and Statistics Guess Paper 2027

Time: 3 hours · Maximum marks: 80 · 33 questions

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Section A

Q1 eight MCQs (2 marks each) and Q2 four very short answer questions (1 mark each)

Q1. The approximate value of the function $f(x) = x^3 - 3x + 5$ at $x = 1.99$ is ____. (a) 6.09 (b) 6.91 (c) 7.09 (d) 7.91 — 2 marks

Q2. If $f(x) = \sin^{-1} x/\sqrt{(1 - x^2)}$ and $g(x) = e^{(\sin^{-1} x)}$ then integral $f(x).g(x)\,dx$ = ____. (a) $e^{(\sin^{-1} x)}(1 - \sin^{-1} x) + c$ (b) $e^{(\sin^{-1} x)}(\sin^{-1} x - 1) + c$ (c) $e^{(\sin^{-1} x)}(\sin^{-1} x + 1) + c$ (d) $e^{(\cos^{-1} x)}(\cos^{-1} x - 1) + c$ — 2 marks

Q3. The value of $\sin[\sin^{-1}(-1/\sqrt{2}) - 3\sin^{-1}(\sqrt{3}/2)]$ = ____. (a) $-1/\sqrt{2}$ (b) $1/\sqrt{2}$ (c) $\sqrt{3}/2$ (d) $-\sqrt{3}/2$ — 2 marks

Q4. The dual of statement $t \vee (p \vee q)$ is ____. (a) $c \wedge (p \vee q)$ (b) $c \wedge (p \wedge q)$ (c) $t \wedge (p \wedge q)$ (d) $t \wedge (p \vee q)$ — 2 marks

Q5. The angle between the lines $r = (i + 2j + 3k) + \lambda(2i - 2j + k)$ and $r = (i + 2j + 3k) + \mu(i + 2j + 2k)$ is ____. (a) $\pi/4$ (b) $\pi/2$ (c) $\pi/3$ (d) 0 — 2 marks

Q6. In a Binomial Distribution, $E(X) = 6$, $Var(X) = 4.2$ then the value of n is ____. (a) 22 (b) 24 (c) 20 (d) 26 — 2 marks

Q7. If $\tan^{-1}(2x) + \tan^{-1}(3x) = \pi/4$, then x = ____. (a) -1 (b) 1/6 (c) 1/3 (d) 3/2 — 2 marks

Q8. If the p.d.f. of a continuous r.v. X is $f(x) = (x + 2)/18$, for $-2 < x < 4$, = 0 otherwise then $P(|X| < 1)$ = ____. (a) 1/9 (b) 2/9 (c) 1/27 (d) 2/27 — 2 marks

Q9. Evaluate: integral $2x/(1 + x^2)\,dx$. — 1 mark

Q10. Write the order of differential equation $(d^2y/dx^2)^{(5/2)}$ = cube root of (dy/dx). — 1 mark

Q11. Find the combined equation of the pair of lines $2x + y = 0$ and $3x - y = 0$. — 1 mark

Q12. What is the distance of point (3, -5, 6) from XZ plane? — 1 mark

Section B

Short answer questions, 2 marks each (attempt any 8 of 12)

Q13. Find the general solution of equation $\cos 5(\theta) = 1/2$. — 2 marks

Q14. Evaluate: integral from 0 to -1 of $e^{(-x)}\,dx$. — 2 marks

Q15. Using the truth table, show that the statement pattern p -> (q -> p) is a tautology. 2 marks

Q16. If a, b, c are the position vectors of points A, B, C respectively and 10a = 7b + 3c then find the ratio in which the point C divides the line segment AB. 2 marks

Q17. Find the area bounded by curve $x^2 + y = 0$, X-axis and lines x = 1 and x = 4. 2 marks

Q18. Using truth table, prove that ~p ^ q = (p v q) ^ ~p. 2 marks

Q19. Solve the differential equation cos x cos y dy - sin x sin y dx = 0. 2 marks

Q20. Test whether the function f(x) = x - 1/x, x in R, x != 0 is increasing or decreasing. 2 marks

Section C
Short answer questions, 3 marks each (attempt any 8 of 12)

Q21. A pair of dice is thrown 4 times. If getting a doublet is considered as success, find the probability of two successes. 3 marks

Q22. Solve the differential equation $x\,dy/dx - \sqrt{x^2 + y^2} = y$. 3 marks

Q23. Prove that: $\sin^{-1}(3/5) + \cos^{-1}(12/13) = \sin^{-1}(56/65)$. 3 marks

Q24. Find the shortest distance between the lines, (x-1)/2 = (y-2)/3 = (z-3)/4 and (x-2)/3 = (y-4)/4 = (z-5)/5. 3 marks

Q25. If $y = \sin^{-1} x$, then show that: $(1 - x^2)\,d^2y/dx^2 - x\,dy/dx = 0$. 3 marks

Q26. Verify Rolle's theorem for the function $f(x) = x^2 - 5x + 9$, x in [1, 4]. 3 marks

Q27. Water is being poured at the rate of 27 m^3/sec into a cylindrical vessel of base radius 3 m. Find the rate at which the water level is rising. 3 marks

Q28. Find the vector equation of the plane passing through the points A(2, 1, 1), B(0, 2, 3) and C(4, 5, 6). 3 marks

Section D
Long answer questions, 4 marks each (attempt any 5 of 8)

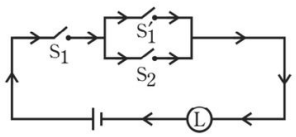
Q29. If x = f(t) and y = g(t) are differentiable functions of t, so that y is differentiable function of x and dx/dt != 0 then prove that dy/dx = (dy/dt)/(dx/dt). Hence find dy/dx, if x = sin t, y = cos t. 4 marks

Q30. Evaluate: integral from 0 to 1/2 of $dx/((1 - 2x^2)\sqrt{1 - x^2})$. 4 marks

Q31. If A = [[1, 2], [3, 4]], prove that A.(adj A) = (adj A).A = |A|.I. 4 marks

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Q32. Give an alternative equivalent simple circuit for the following switching circuit. (Switch S1 in series with a parallel block of switches S1' and S2', with lamp L.) 4 marks



(4)

Q33. Find the inverse of matrix [[-4, -3, -3], [1, 0, 1], [4, 4, 3]]. 4 marks

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