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| **PB1/MAQP/1223/A 27-NOV-2023** |

**PRE-BOARD EXAMINATION – I (2023-2024)**

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| **SUBJECT: Mathematics**  **GRADE: XII** | **Maximum Marks: 80****Time Allowed: 3 Hours** |
| General Instructions :  1. This Question paper contains - five sections A, B, C, D and E. Each section is  compulsory. However, there are internal choices in some questions.  2. Section A has 18 MCQ’s and 02 Assertion-Reason based questions of 1 mark each.  3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.  4. Section C has 6 Short Answer (SA)-type questions of 3 marks each.  5. Section D has 4 Long Answer (LA)-type questions of 5 marks each.  6. Section E has 3 source based/case based/passage based/integrated units of  assessment (4 marks each) with sub parts  7. All Questions are compulsory. However, an internal choice in 2 Questions of 2 marks, 2 Questions of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.  8. Draw neat figures wherever required. Take π = wherever required if not stated. | |

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| **SECTION A**  **(Multiple Choice Questions) Each question carries 1 mark** | |
| **1.** | If λ is a unit vector, then the value of λ is  (b) ± 7 (c) ±43 (d) ± |
| **2.** | If A is a square matrix of order 3 and =64, then  a)32 b) 16 c) 4 d) 8 |
| **3.** | If and are two non-zero vectors such that the projection of is 0, The angle between and is  (a) 0            (b)         (c)           (d) |
| **4.** | Find the value of k, if f(x)= is continuous at x=0  (b) (c) 0 (d) 1 |
| **5.** | If A= ,then the value of ‘k’ so that   1. 2 b) 3 c) 1 d) 4 |
| **6.** | If x= a sec3θ, y = a tan3θ, then at θ = π is  a)0 (b) 1 (c) π (d) -1 |
| **7.** | The feasible for an LPP is shown below. Let be the objective function. The minimum of Z occurs at   1. (0, 0) 2. (0, 8) 3. (5, 0) 4. (4, 10) |
| **8.** | Find the value of k if the area of the triangle is 7 sq. units and the vertices are (1,3), (0,5) and (k,0)  b) c) d) |
| **9.** | =  a) c) d) |
| **10.** | If A = B = then A-1  is  a) 8 B b) 6 B c) B/8 d) B/6 |
| **11.** | In an LPP, if the objective function Z=ax +by has the maximum value on two corner points of the feasible region, then the number of points at which Zmax occurs is   1. 0 b)2 c) finite d) infinite. |
| **12.** | Evaluate  2 b) 4 c) 3 d) 8 |
| **13.** | If m and n are the order and degree, respectively of  y + x3  a) 4 b) 3 c) not defined d) 5 |
| **14.** | The direction ratios of the line .  a) b) c d) |
| **15.** | A straight line makes angles 60 and 45 with the positive directions of X-axis and Y-axis respectively, then the acute angle it makes with the Z axis is  a) 300 b) 900 c) 600  d) 450 |
| **16.** | Find the general solution of: = (-2 < y < 2)  (a) sin-1 y = x + c (b) sin-1  = x + c (c) sin-1 y2 = x + c (d) None of the above |
| **17.** | If are such that is perpendicular to, find the value of.  a)8 b) 4 c) 1 d) 2 |
| **18.** | For the matrices X, Y and Z if Xmx3.Ypx4= Z2xb then values m, p and b are   1. m=2, p=3, b=4 (b) m=2, p=4, b=3 (c) m=4, p=2, b=3 (d) m=4, p=3, b=2 |
|  | **ASSERTION-REASON BASED QUESTIONS**  In the following questions, a statement of assertion (A) is followed by a statement of  Reason (R). Choose the correct answer out of the following choices.  (a) Both A and R are true, and R is the correct explanation of A.  (b) Both A and R are true, but R is not the correct explanation of A.  (c) A is true but R is false.  (d) A is false but R is true. |
| **19.** | **Assertion(A):** Let A= {1,2,3} then define a relation on A as R={(1,2),(2,1)},R is not a transitive relation.  **Reason(R):** A relation R defined on a non-empty set A is said to be transitive relation if (a,b),(b,c) R (a,c) R |
| **20.** | **Assertion(A):** If y = is 0  **Reason(R):** |
| **SECTION B**  **This section comprises of very short answer type-questions (VSA) of 2 marks each** | |
| **21.** | Find the value of  **OR**  Evaluate: tan-1[2 cos(2 sin-1)]. |
| **22.** | Find the value of a for which the function f(x)=sinx -ax +b increases on R  OR  Show that the function f defined by f(x)= |
| **23.** | Given that at x=1, f (x)=attains the maximum value in the interval [0,2]. Find the value of a. |
| **24.** | A ladder, 5m long, standing on a horizontal floor, leans against a vertical wall. If the top of the ladder sides downwards at the rate of 10 cm/sec, find the rate at which the angle between the floor and the ladder is decreasing when lower end of ladder is 2 m from the wall. |
| **25.** | Evaluate: |
|  | **SECTION C**  **(This section comprises of short answer type questions (SA) of 3 marks each)** |
| **26.** | Evaluate the integrals dx  **OR**  Evaluate dx |
| **27.** | If  and , find |
| **28.** | Find the particular solution of  **OR**  Find the general solution of |
| **29.** | Solve the following linear programming problem (LPP) graphically:  Maximum the value of Z = 2x + 5y, subject to constraints given below  2x+ 4y  **OR**  Minimize Z = 5x + 10y, subject to constraints;  x + 2y |
| **30.** | Evaluate |
| **31.** | Check whether the following differential equation is homogenous or not: .Find the general solution of the differential equation |
|  | **SECTION D**  **(This section comprises of long answer-type questions (LA) of 5 marks each)** |
| **32.** | Find the co-ordinates of the foot of the perpendicular and the perpendicular distance drawn from the point P (2, 3, -8) to the line . Also find the image of the point P in this line. |
| **33.** | If A= ,find A-1and use the result to solve the following system of equations:  x – y + z = 1 - x + 2y + 3z – 4 = 0 x + y + 5z = 7  **OR**  Find the inverse of the matrix  and hence solve the matrix equation |
| **34.** | Find the area of the region bounded by the triangle whose vertices are A (1, 2), B (2, 0) and C(4, 3), using integration. |
| **35.** | Let N be the set of all natural numbers and R be the relation on defined by  if and only if  Show that R is an equivalence relation  OR  Show that the function f: R x R: -1< x<1} defined by f(x)= , x R is one-one and onto function. |
|  | **SECTION E**  **(This section comprises of 3 case study/passage -based questions of 4 marks each with two sub-parts. First two case study questions have three sub-parts (i),(ii),(iii) of marks 1,1,2 respectively. The third case study question has two sub-parts of 2 marks each.)** |
| **36.** | A cycle racer in the morning is cycling in a free cycling track and sometimes moving zig-zag.It is found that the path traced by the cyclist is given by the curve  f(x)=(x-1)(x-2)2.  If at any part of time cyclist is at a point P(x,y).  Based on the above information and tracking path to be a mathematical statement, answer the following.  i)Find the value of x for stationary point .  ii)Find the intervals for which f(x) is increasing  iii)Find the local minimum of f(x) is attained for x |
| **37.** | Ginni purchased an air plant holder which is in the shape of a tetrahedron. Let A, B, C and D are the coordinates of the air plant holder where A = (1, 2, 3), B = (3, 2, 1), C = (2, 1, 2) and D = (3, 4, 3)  a) Find the vector AB.  b) Find the unit vector along BC  c) Find the area of triangle BCD |
| **38.** | Two motorcycles A and B are running at the speed more than the allowed speed on the roads represented by the lines = and = respectively.  a) Find the shortest distance between the given lines.  b) Find the point at which the motorcycles may collide. |

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