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| **PB2/MAEEEQP/1222/A 09-JAN-2023** |

**EEE CONSORTIUM**

**PRE-BOARD EXAMINATION – II (2022-2023)**

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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.** | Given that is a singular matrix, then the value of k is  b) c) d) |
| **2.** | If A= and = 125, then, find the value of .   1. -5 (b) ±5 (c) ±3 (d) 5/2 |
| **3.** | If and is a vector such that = and , then is equal to  (a)             (b)           (c) 3          (d) 7 |
| **4.** | The value of a for the function to be continuous at is   1. -3 b) 3 c) 0 d) 4 |
| **5.** | is equal to a) b)  c) d) |
| **6.** | The degree of the differential equation is a) 3 b) 2 c) 1 d) not defined |
| **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.** | The projection of the vector  on the vector   is  (a)  (b)  (c)  (d) |
| **9.** | is equal to  (a) e+1 (b) e-1 (c) e (d) -e |
| **10.** | If then is eqiual to  b) c) d) |
| **11.** | Corner points of the feasible region for an LPP are : (0,2), (3,0), (6,0), (6,8) and (0,5). Let be the objective function. Then, Max. Z Min. Z is   1. 80 b) 50 c) 30 d) 60 |
| **12.** | If is an acute angle and , then the value of  a) b) c) d) |
| **13.** | 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) |
| **14.** | A speaks truth in 60% cases and B speaks truth in 90% cases. Probability that they contradict each other in a statement, is   1. b) c) d) |
| **15.** | Integrating factor of the differential equation is   1. Cos x (b) Secx (c) (d) |
| **16.** | If then is equal to  b) c) d) |
| **17.** | If two vectors and are such that and , then find the value of  a)5 b) 3 c) 0 d) 1 |
| **18.** | The shortest distance between the lines and is  a) b) 2 c) 3 d) 5 |
|  | **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):**  **Reason (R):** is a bijection. |
| **20.** | Assertion (A): P is a point on the line segment joining the points and . If coordinate of P is 5, then its coordinate is .  Reason (R): The two line and will be perpendicular, iff . |
| **SECTION B**  **This section comprises of very short answer type-questions (VSA) of 2 marks each** | |
| **21.** | Write the following function in simplest form:  **OR**  Consider Show that f is bijective. |
| **22.** | The area of an expanding rectangle is increasing at the rate of 48 . The length of the rectangle is always equal to square of breadth. At what rate, the length is increasing at the instant when breadth is 4.5 cm ? |
| **23.** | If then find a unit vector perpendicular to both vectors  **OR**  **Find the direction cosines of the line passing through the two points (– 2, 4, – 5) and**  **(1, 2, 3).** |
| **24.** | Find the values of so that the function is continuous at |
| **25.** | If the sum of two-unit vectors is a unit vector, prove that the magnitude of their difference is |
|  | **SECTION C**  **(This section comprises of short answer type questions (SA) of 3 marks each)** |
| **26.** | Evaluate dx |
| **27.** | A and B take turns in rolling a pair of dice till one of them wins and the game ends. A wins if he gets a sum of 6 before B gets a sum of 7 and B wins if he gets a sum of 7 before A gets a sum of 6. If A starts, find the probability that B wins the game.  **OR**  In a group of 50 scouts in a camp, 30 are well trained in first aid techniques while the remaining are well trained in hospitality, but not in first aid. Two scouts are selected at random from the group. Find the probability distribution of the number of selected scouts who are well trained in first aid. Find the mean of the distribution also. |
| **28.** | Evaluate:  ***(OR***  Evaluate: |
| **29.** | Solve the differential equation: .  **(OR)**  Solve the differential equation: |
| **30.** | Maximize the function  Subject to the constraints, |
| **31.** | Evaluate |
|  | **SECTION D**  **(This section comprises of long answer-type questions (LA) of 5 marks each)** |
| **32.** | Using integration, find the area of the region |
| **33.** | Let Show that is an equivalence relation. Find the equivalence class of 2.  **(OR)**  Let A=and R be the relation in A x A defined by (a, b) R (c, d) if a +d = b +c for (a, b), (c, d) in A x A. Prove that R is an equivalence relation. Also, obtain the equivalence class . |
| **34.** | Find the shortest distance between the following two lines: **OR**  Find the equation of the line passing through the point (2, 1, 3) and perpendicular to the lines  = = and = = . |
| **35.** | A school wants to award its students for the values of Honesty, Regularity and Hard work with a total cash award 6,000. Three times the award money for hard work added to that given for Honesty amounts to The award money given for Honesty and Hard work together is double the one given for Regularity. Represent the above situation algebraically and find the award money for each value, using matrix method |
|  | **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.** | Read the following passage and answer the questions given below.  The total cost C(x) in rupees, associated with the production of unit by a factory is given by     1. Is this function differentiable in (0,15)? 2. If 5 is the critical point of the function, find the value of . 3. Find the interval in which function is strictly increasing/decreasing   **OR**  (iii) Find the points of local maxima/minima, in the interval (0,15) as well as the point of absolute maxima/minima in the interval [0,15]. Also find the local maxima/ local minima and the absolute maximum/absolute minimum values of the function. |
| **37.** | **Case study 2**  In an elliptical sport field the authority wants to design a rectangular soccer field with maximum possible area.  The sport field is given by   1. If the length and breadth of the rectangular field be 2x and 2y respectively, then find the area function in terms of x. 2. Find the critical point of the function. 3. Use First Derivative Test to find the length 2x and breadth 2y of the soccer field that maximize the area.   **OR**  iii)Use Second Derivative Test to find the length 2x and breadth 2y of the soccer field that maximize its area |
| **38.** | Case study 3    In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their outputs 5, 4 and 2 percent are respectively defective bolts. A bolt is drawn at random from the product and is found to be defective. Based on the above information answer the following questions:  a) What is the probability that it is manufactured by the machine B? b) What is the probability that it is manufactured by the machine C? |

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