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THE INDIAN SCHOOL , KINGDOM OF BAHRAIN

FIRST TERMINAL EXAMINATION –JUNE 2009

STD : XII — MARKS :100

SUBJECT : Mathematics — TIME : 3Hrs

GENERAL INSTRUCTIONS:

(i) This question paper consist of **29** questions divided into three sections A,B and C .

(ii) **Section A** consist of **10** questions of **1** mark each.

(iii) **Section B** consist of **12** question of **4** marks each .

(iv) **Section C** consist of 7 questions of 6 mark each .

(v) This question paper consist of **3** printed pages .

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Section A

1. If $A = \begin{bmatrix} 3 & -4 \\ -1 & 2 \end{bmatrix}$, find A^{-1}.

2. Find x and y if : $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + 2\begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = 2\begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$.

3. Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$

4. Define $\vec{a} \times \vec{b}$.

5. Find the vector parallel to $4\hat{i} + 3\hat{j} + 4\hat{k}$ and having magnitude of 12 units.

6. Find the direction cosines of the line passing through the points (-2,4,-5) and (1,2,3).

7. If P(A) = 3/5 and P(B) = 1/5, find $P(A \cap B)$ if A and B are independent..

8. The Probability distribution of X is

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

find the value of k..

9. If f: R→R such that $f(x) = \frac{4x-3}{3}$, $\forall x \in R$ then write f^{-1} : R→R .

10. If $f(x) = \frac{4x+3}{6x-4}$, $x \neq \frac{2}{3}$ find $fof(x)$.

Section B

11. If $A=\begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$ then verify that $A^2-5A+7I=0$ where I is the identity matrix of order 2.

12. Express the matrix $\begin{bmatrix}3 & 3 & -1\\ -2 & -2 & 1\\ -4 & -5 & 2\end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix.

13. Prove that $\begin{vmatrix}a-b-c & 2a & 2a\\ 2b & b-c-a & 2b\\ 2c & 2c & c-a-b\end{vmatrix} = 2(a+b+c)^3$

14. Find the inverse of the matrix $A = \begin{bmatrix}0 & 1 & 2\\ 1 & 2 & 3\\ 3 & 1 & 1\end{bmatrix}$ using elementary operations.

15. Let $\vec{a}$, $\vec{b}$ and $\vec{c}$ be three vectors such that $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{c}| = 5$. And each one of them being perpendicular to the sum of the other two, find $|\vec{a}+\vec{b}+\vec{c}|$.

16. Find a unit vector perpendicular to each of the vectors $\vec{a}= 2\hat{i}+\hat{j}+3\hat{k}$ $\vec{b}=3\hat{i}+5\hat{j}-2\hat{k}$.

17. Find the shortest distance between the lines whose vector equations are $\vec{r}=(\hat{i}+2\hat{j}+\hat{k})+\lambda(\hat{i}-3\hat{j}+2\hat{k})$ and $\vec{r}=(4\hat{i}+5\hat{j}+6\hat{k})+\mu(2\hat{i}+3\hat{j}+\hat{k})$.

18. Find the angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=3$.

19. A and B throw a die alternatively till one of them gets a 6 and wins the game .Find their respective probabilities of winning .If A starts first .

20. It is known that 10% of certain articles manufactured are defective. What is the probability that in a sample of 12 such articles, 9 are defective.

21. Consider $f: R\rightarrow[-5,\infty]$ given by $f(x) = 9x^2+6x-5$. Find $f^{-1}(x)$.

(Or)

Check whether the relation R defined in the set {1,2,3,4,5,6} as R = {(a,b) : b = a+1} is reflexive, symmetric or transitive.

22. Determine whether the binary operation $a*b=\frac{(a+b)}{2}$, $\forall a,b \in N$ is associative or commutative.

(Or)

If $f: R\rightarrow R$ is defined by $f(x) = x^2-3x+2$ find $f(f(x))$.

Section C

23. Solve the system of equation using matrix method: 3x -2y + 3z =8 , 2x +y –z =1 and 4x -3y +2z =4 .

24. Verify that the points A,B and C with position vectors $\vec{a} = 3\hat{i} - 4\hat{j} - 4\hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ and $\vec{c} = \hat{i} - 3\hat{j} - 5\hat{k}$, respectively form the vertices of a right angled triangle.

25. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ and $A^2 - 4A - 5I = 0$, find A^{-1} .

26. Find the equation of the line passing through the points (1 ,2, -4) and perpendicular to the two lines : $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

27. Find the distance of the point (1,-2,3) from the plane x – y +z =5measured parallel to the line $\frac{x+1}{2} = \frac{y+3}{3} = \frac{z+1}{-6}$.

28. Suppose that the reliability of a HIV test is specified as follows : Of people having HIV, 90% of the test detect the disease but 10% go undetected. Of people free of HIV 99% of the test are judged HIV –ve but 1% are diagnosed as showing HIV +ve. From a large population of which only 0.1% have HIV, one person is selected at random, given the HIV test. And pathologist reports him/her as HIV +ve. What is the probability that the person actually has HIV ?

Or

A doctor is to visit a patient. From the past experience , it is known that the probabilities tht he will come by train , bus , scooter or by other means of transport are respectively (3/10), (1/5), (1/10) and (2/5). The probability that he will be late are (1/4), (1/3) and (1/12), if he comes by train, bus and scooter respectively, but if he comes by other means of transport , then he will not be late. When he arrives, he is late . What is the probability that he comes by train.

29. Two cards are drawn simultaneously (successively without replacement) from a well shuffled deck of 52 cards. Find mean and standard deviation of number of kings.

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