Summer feilds

Series.	K I	R II	M III	GIV

Roll No.			

Code No.-1/1/1

Candidate must write the Code No. on the title page of the answer book.

- Please check that this question paper contains **4** printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **29** questions.
- Please write down the Serial Number of the question before attempting it.

FIRST TERM EXAMINATION 2016 -17
SUBJECT CODE - 041

Time allowed: **3 Hours** Maximum Marks: **100**

General Instructions:

1. All questions are compulsory.
2. This question paper consists of **29** questions divided into 4 sections **A, B, C** and **D**.
3. Question 1- 4 in Section **A** are very short-answer type questions carrying 1 mark each.
4. Question 5-12 in Section **B** are short-answer type questions carrying 2 marks each.
5. Question 13-23 in Section **C** are long-answer-I type questions carrying 4 marks each.
6. Question 24-29 in Section **D** are long-answer-II type questions carrying 6 marks each.
7. There is no overall choice. However, internal choice has been provided in **3** questions of four marks each and **3** questions of six marks each. You have to attempt only one of the given choices.

SECTION A

1 Find the principal value of $\tan^{-1}\left(-\sqrt{3}\right)$.

2 If A is a square matrix and $|A|=2$ then write the value of $|AA'|$ where A' is transpose of matrix A.

3 If $\int_0^a \frac{1}{4+x^2}dx=\frac{\pi}{8}$, find the value of a.

4 Find $\frac{dy}{dx}$ for $2\sqrt{\cot(x^2)}$.

SECTION-B

5 Represent $\cot\left(\sin^{-1} x\right), |x| < 1$ in terms of x only.

6 If the matrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix , find the value of a, b and c.

7 The sides of an equilateral triangle are increasing at the rate of 2cm/s. Find the rate at which the area increases when the side is 10cm.

8 Using differential, find approximate value of $(255)^{\frac{1}{4}}$.

9 Evaluate $\int \frac{1-\sin 2x}{x+\cos^2 x} dx$

10 Show that $y = \cos x + 9$ is solution of differential equation $\frac{dy}{dx} + \sin x = 0$.

11 Four cards are drawn at random from a well shuffled pack of 52 cards. Find the probability of getting 3 diamonds and one spade.

12 Examine the following function for continuity at x=1

$$f(x) = \begin{cases} 5x-4 & \text{if } 0 < x < 1 \\ 4x^2 - 3x & \text{if } 1 \le x < 2 \\ 3x+4 & \text{if } x \ge 2 \end{cases}$$

SECTION C

13 Show that $\begin{bmatrix} 1 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 1 \end{bmatrix} \begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}^{-1} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$.

14 If a, b, c are real numbers and

$\Delta = \begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} = 0$, show that either $a+b+c=0$ or $a=b=c$.

15 Solve for x, $\tan^{-1}\left(\frac{1-x}{1+x}\right)=\frac{1}{2}\tan^{-1}x, x>0.$

16 If $y=\frac{\sin^{-1}x}{\sqrt{1-x^2}}$ then show that $(1-x^2)\frac{d^2y}{dx^2}-3x\frac{dy}{dx}-y=0.$

OR

Let $y=(\log x)^x+x^{x\cos x}$, then find $\frac{dy}{dx}$.

17 If $x=\alpha\sin 2t(1+\cos 2t)$ and $y=\beta\cos 2t(1-\cos 2t)$ show that $\frac{dy}{dx}=\frac{\beta}{\alpha}\tan t.$

18 Three person A,B,C fire a target in turn, starting with A. Their probabilities of hitting the target are 0.5, 0.3 and 0.2 respectively. Find the probability of at most one hit. In life we must set a target. To achieve the target we need to follow some qualities. Mention any two such qualities.

19 Find the interval in which the function $f(x)=3x^4-4x^3-12x^2+5$ is strictly increasing or decreasing function.

OR

Prove that the function f given by $f(x)=\frac{4\sin x}{2+\cos x}-x$ is increasing in $\left[0,\frac{\pi}{2}\right]$.

20 Evaluate $\int\frac{\sin x}{\sin 3x}dx.$

21 Evaluate $\int_0^{\pi}\frac{x\tan x}{\sec x+\tan x}dx$

OR

Evaluate $\int_0^{\pi}\frac{x\sin x}{1+\cos^2 x}dx.$

22 Form a differential equation of family of ellipses having foci on x-axis and centre at the origin.

23 Solve the differential equation $\sqrt{1+x^2+y^2+x^2y^2}+xy\frac{dy}{dx}=0.$

SECTION-D

24 If $A=\begin{bmatrix}1&1&1\\1&2&-3\\2&-1&3\end{bmatrix}$, find A^{-1}. Using A^{-1}, solve the following system of equation :

$x+y+2z=0;\ x-3y+3z=-14;\ x+2y-z=9.$

OR

Given $A=\begin{bmatrix}2 & 2 & -4\\ -4 & 2 & -4\\ 2 & -1 & 5\end{bmatrix}, B=\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$ find BA and use this to solve

$$y+2z=7,\quad x-y=3,\quad 2x+3y+4z=17.$$

25 A firm has to transport 1200 packages using large vans which carry 200 packages eachand small vans can carry 80 packages each. The cost for engaging each large van is Rs400 and each small van is Rs 200. Not more than Rs 3000 is to be spent on the job and number of large vans cannot exceed the number of small vans. Formulate this problem as LPP, given that objective is to minimize the cost.

26 Show that the altitude of a right circular cone of maximum volume that can be inscribed in a sphere of radius r is $\frac{4r}{3}$. Also find the maximum volume.

27 Evaluate $\int_{-1}^{\frac{3}{2}} |x \sin \pi x|\, dx$.

OR

Evaluate $\int_{0}^{4} \left(x+e^{2x}\right) dx$ as the limit of sums.

28 Find the area of the region using method of integration:

$\{(x,y): 0 \le y \le x^2+3, 0 \le y \le 2x+3, 0 \le x \le 3\}$

29 There is a group of 20 people who are rich,out of these 5 are helpful to poor people. Three people are selected at random; write the probability distribution for the selected persons who are helpful to poor people. Also find mean for the distribution.

OR

Bag A contain 4 red and 5 black balls and Bag B contain 3 red and 4 black balls. One ball is transferred from bag A to bag B and then two balls are drawn at random(without replacement) from bag B .The ball so drawn are both found to be black. Find the probability that the transferred ball is black in colour.