KERALA BOARD CLASS 12
MATHS MARCH 2017 QUESTION PAPER

Code No. 5018

Name : .....

Second Year – March 2017

Time : 2½ Hours
Cool-off time : 15 Minutes

Part – III

MATHEMATICS (SCIENCE)

Maximum : 80 Scores

General Instructions to Candidates :

- There is a 'cool-off time' of 15 minutes in addition to the writing time of 2 hrs.
- You are not allowed to write your answers nor to discuss anything with others during the 'cool-off time'.
- Use the 'cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- All questions are compulsory and only internal choice is allowed.
- When you select a question, all the sub-questions must be answered from the same question itself.
- Calculations, figures and graphs should be shown in the answer sheet itself.
- Malayalam version of the questions is also provided.
- Give equations wherever necessary.
- Electronic devices except non-programmable calculators are not allowed in the Examination Hall.

നിർദ്ദേശങ്ങൾ

- നിർദ്ദിഷ്ട സമയത്തിന് പുറമെ 15 മിനിറ്റ് 'കൂൾ ഓഫ് ടൈം' ഉണ്ടായിരിക്കും. ഈ സമയത്ത് ചോദ്യങ്ങൾക്ക് ഉത്തരം എഴുതാനോ, മറ്റുള്ളവരുമായി ആശയവിനിമയം നടത്താനോ പാടില്ല.
- ഉത്തരങ്ങൾ എഴുതുന്നതിന് മുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കണം.
- എല്ലാ ചോദ്യങ്ങൾക്കും ഉത്തരം എഴുതണം.
- ഒരു ചോദ്യനമ്പർ ഉത്തരമെഴുതാൻ തെരഞ്ഞെടുത്തു കഴിഞ്ഞാൽ ഉപചോദ്യങ്ങളും അതേ ചോദ്യനമ്പരിൽ നിന്ന് തന്നെ തെരഞ്ഞെടുക്കേണ്ടതാണ്.
- കണക്ക് കൂട്ടലുകൾ, ചിത്രങ്ങൾ, ഗ്രാഫുകൾ എന്നിവ ഉത്തരപേപ്പറിൽ തന്നെ ഉണ്ടായിരിക്കണം.
- ചോദ്യങ്ങൾ മലയാളത്തിലും നൽകിയിട്ടുണ്ട്.
- ആവശ്യമുള്ള സ്ഥലത്ത് സമവാക്യങ്ങൾ കൊടുക്കണം.
- പ്രോഗ്രാമുകൾ ചെയ്യാനാകാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഒരു ഇലക്ട്രോണിക് ഉപകരണവും പരീക്ഷാഹാളിൽ ഉപയോഗിക്കുവാൻ പാടില്ല.

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1.

(a) Let R be a relation defined on A = {1, 2, 3} by R = {(1, 3), (3, 1), (2, 2)}. R is

(a) Reflexive (b) Symmetric ✓

(c) Transitive (d) Reflexive but not transitive **(Score : 1)**

(b) Find fog and gof if $f(x) = |x + 1|$ and $g(x) = 2x - 1$. **(Scores : 2)**

(c) Let * be a binary operation defined on N x N by (a, b) * (c, d) = (a + c, b + d). Find the identity element for * if it exists (score: 2)

2. (a) Principal value of $\cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ is

(a) $\frac{\pi}{3}$ (b) $-\frac{\pi}{3}$

(c) $\frac{\pi}{6}$ (d) $\frac{2\pi}{3}$

3.

3. (a) The value of k such that the matrix $\begin{pmatrix} 1 & k \\ -k & 1 \end{pmatrix}$ is symmetric is

(a) 0 (b) 1

(c) −1 (d) 2 **(Score : 1)**

(b) If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then prove that $A^2 = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$. **(Scores : 3)**

(c) If $A = \begin{bmatrix} 1 & 3 \\ 4 & 1 \end{bmatrix}$, then find $|3A'|$. **(Scores : 2)**

4.

(a) If $A = \begin{bmatrix} a & 1 \\ 1 & 0 \end{bmatrix}$ is such that $A^2 = I$ then a equals

(a) 1 (b) −1

(c) 0 (d) 2 **(Score : 1)**

5.

(a) Find the values of a and b such that the function

$$f(x) = \begin{cases} 5a & x \le 0 \\ a\sin x + \cos x & 0 < x < \frac{\pi}{2} \\ b - \frac{\pi}{2} & x \ge \frac{\pi}{2} \end{cases}$$ is continuous. **(Scores : 3)**

(b) Find $\frac{dy}{dx}$ if $(\sin x)^{\cos y} = (\cos y)^{\sin x}$. **(Scores : 3)**

6. Slope of the normal curve $Y^2 = 4X$ at (1, 2) is

(a) 1 (b) ½ (c)2 (d)-1 (score:1)

(b) Find the interval in which $2x^3 + 9x^2 + 12x - 1$ is strictly increasing. **(Scores : 4)**

Or

(a) The rate of change of volume of a sphere with respect to its radius when radius is 1 unit

(a) 4π (b) 2π

(c) π (d) $\frac{\pi}{2}$ **(Score : 1)**

(b) Find two positive numbers whose sum is 16 and the sum of whose cubes is minimum. **(Scores : 4)**

7. Find the following:

(a) $\int \frac{1}{x(x^7+1)}\,dx$ **(Scores : 3)**

(b) $\int_1^4 |x-2|\,dx$ **(Scores : 3)**

8.

Evaluate $\int_0^{\pi/2} \log \sin x\,dx$. **(Scores : 4)**

OR

Evaluate $\int_0^4 x^2 dx$ as the limit of a sum. **(Scores : 4)**

9.(a) Area bounded by the curves $y = cosx, x = \frac{\pi}{2}, x = \theta, y = 0$ is

(a) $\frac{1}{2}$ (b) $\frac{2}{\pi}$

(c) 1 (d) $\frac{\pi}{2}$

10.

(a) The order of the differential equation $x^4\frac{d^2y}{dx^2} = 1 + \left(\frac{dy}{dx}\right)^3$ is

(a) 1 (b) 3

(c) 4 (d) 2 **(Score : 1)**

(b) Find the particular solution of the differential equation

$(1 + x^2)\frac{d^2y}{dx^2} + 2xy = \frac{1}{1+x^2}$, $y = 0$ when $x = 1$. **(Scores : 5)**

11.

(a) The projection of the vector $2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\hat{i} + \hat{j} + \hat{k}$ is

(a) $\frac{3}{\sqrt{3}}$ (b) $\frac{7}{\sqrt{3}}$

(c) $\frac{3}{\sqrt{17}}$ (d) $\frac{7}{\sqrt{17}}$ **(Score : 1)**

(b) Find the area of a parallelogram whose adjacent sides are the vectors $2\hat{i} + \hat{j} + \hat{k}$ and $\hat{i} - \hat{j}$. **(Scores : 2)**

12.

(a) The angle between the vectors $\hat{i} + \hat{j}$ and $\hat{j} + \hat{k}$ is

(a) 60° (b) 30°

(c) 45° (d) 90° **(Score : 1)**

(b) If $\vec{a}, \vec{b}, \vec{c}$ are unit vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, find the value of $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ **(Scores : 4)**

13. (i) The line x-1=y=z is perpendicular to the line (score:1)

(a) $\frac{x-2}{1}=\frac{y-1}{2}=\frac{z}{-3}$
(b) x-2=y-2=z
(c) $\frac{x-2}{1}=\frac{y-1}{2}=\frac{z}{3}$ (d) $x=y=\frac{2}{3}$

(ii) Find the shortest distance between the lines (score:3)

$\vec{r} = i + 2j + 3k + \lambda(i + j + k)$

$\vec{r} = i + j + k + \mu(i + j + k)$

14. (a) Distance of the point (0, 0, 0) from the plane $x + y + z = 3$.

(i) $\frac{1}{\sqrt{3}}$ (ii) $\frac{2}{\sqrt{3}}$
(iii) $\frac{\sqrt{3}}{2}$ (iv) $\sqrt{3}$

15. Consider the linear programming problem:

Maximize $Z = 50x + 40y$

Subject to the constraints

$x + 2y \geq 10$

$3x + 4y \leq 24$

$x \geq 0, y \geq 0$

(a) Find the feasible region. **(Scores : 3)**
(b) Find the corner points of the feasible region. **(Scores : 2)**
(c) Find the maximum value of Z. **(Score : 1)**

16. (a) If A and B are two events such that $A \subset B$ and $P(A) \neq 0$ then $P(A/B)$ is_____

(a) $\frac{P(A)}{P(B)}$ (b) $\frac{P(B)}{P(A)}$

(c) $\frac{1}{P(A)}$ (d) $\frac{1}{P(B)}$ **(Score : 1)**

(b)There are two indentical bags. Bag 1 contains 3 red and 4 black balls, while Bag 2 contains 5 red and 4 black balls. One ball is drawn at a random from one of the bags.

(i)Find the probability that the ball drawn is red
(ii)If the ball drawn is red, what is the probability that it is drawn from bag 1

Or

Consider the following probability distribution of a random variable x. (score:1)

X	0	1	2	3	4
P(X)	$\frac{1}{16}$	$\frac{2}{16}$	K	$\frac{5}{16}$	$\frac{1}{16}$

(i) Find the value of K.

(ii) Determine the Mean and Variance of X.

(score:4)