

SECOND YEAR HIGHER SECONDARY SAMPLE QUESTION PAPER 2023
MATHEMATICS
PART III

Time: 2 Hours
Cool-off time: 15 minutes

Maximum: 60 Scores

General Instructions to Candidates:

- There is a 'Cool-off time' of 15 minutes in addition to the writing time.
- Use the 'Cool-off time' to get familiar with questions and to plan your answers.
- Read questions carefully before answering.
- Read the instructions carefully.
- 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

ഉദ്യോഗാർത്ഥികൾക്കുള്ള പൊതു നിർദ്ദേശങ്ങൾ:

- എഴുതുന്ന സമയത്തിന് പുറമെ 15 മിനിറ്റിന്റെ 'കൂൾഓഫ് സമയം' ഉണ്ട്.
- ചോദ്യങ്ങളുമായി പരിചയപ്പെടാനും നിങ്ങളുടെ ഉത്തരങ്ങൾ ആസൂത്രണം ചെയ്യാനും 'കൂൾഓഫ് സമയം' ഉപയോഗിക്കുക.
- ഉത്തരം നൽകുന്നതിനുമുമ്പ് ചോദ്യങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കുക.
- നിർദ്ദേശങ്ങൾ ശ്രദ്ധാപൂർവ്വം വായിക്കുക.
- കണക്കുകൂട്ടലുകളും കണക്കുകളും ഗ്രാഫുകളും ഉത്തരകടലാസിൽ തന്നെ കാണിക്കണം.
- ചോദ്യങ്ങളുടെ മലയാളം പതിപ്പും നൽകിയിരിക്കുന്നു.
- ആവശ്യമുള്ളിടത്തെല്ലാം സമവാക്യങ്ങൾ നൽകുക.
- പ്രോഗ്രാമബിൾ അല്ലാത്ത കാൽക്കുലേറ്ററുകൾ ഒഴികെയുള്ള ഇലക്ട്രോണിക് ഉപകരണങ്ങൾ പരീക്ഷാഹാളിൽ അനുവദനീയമല്ല

Answer any 6 questions from 1 to 8. Each carries 3 scores

1) (i) The relation $R = \{ (1,1), (2,2), (3,3), (1,2), (2,3) \}$ on the set $A = \{1,2,3\}$ is

a) Reflexive but neither symmetric nor transitive

b) Symmetric and transitive but not reflexive

c) An equivalence relation

d) Symmetric only (1)

(ii) Show that the relation R on the set of Real numbers defined as $R = \{(a,b) : a \leq b^2\}$ is neither reflexive nor symmetric and nor transitive. (2)

2) Express $A = \begin{bmatrix} 2 & 5 & 3 \\ 4 & 6 & 1 \\ 1 & -2 & 3 \end{bmatrix}$ as the sum of symmetric and skew symmetric matrix. (3)

3) (i) A is a singular matrix, then $|A| = ____$. (1)

(ii) Using determinant find the area of the triangle with vertices $(2,7)$, $(1,1)$, $(10,8)$ (2)

4) A stone is dropped into a quite lake and waves move in circles at the rate of 4cm/sec. At what rate is the enclosed area increasing when the radius is 10 cm. (3)

5) Find the maximum and minimum value of $x^3 + 6x^2 + 9x + 15$ (3)

6) (i) If \vec{a} and \vec{b} are perpendicular, then $\vec{a} \cdot \vec{b} = ____$. (1)

(ii) Find the projection of $\vec{a} = \hat{i} + \hat{j} + 3\hat{k}$ on $\vec{b} = \hat{i} + \hat{j} - \hat{k}$ (2)

7) (i) Write the condition for which two lines $\frac{x-x_1}{a_1} = \frac{y-y_1}{b_1} = \frac{z-z_1}{c_1}$ and $\frac{x-x_2}{a_2} = \frac{y-y_2}{b_2} = \frac{z-z_2}{c_2}$ are perpendicular. (1)

(ii) Show that the lines $\frac{x-3}{2} = \frac{y-4}{3} = \frac{z-1}{3}$ and $\frac{x+2}{6} = \frac{y-2}{-5} = \frac{z+1}{1}$ are perpendicular. (2)

8) If $P(A) = \frac{7}{13}$, $P(B) = \frac{9}{13}$ and $P(A \cap B) = \frac{4}{13}$ find

(i) $P(A \cup B)$ (ii) $P(A/B)$ (iii) $P(B/A)$ (3)

Answer any 6 questions from 9 to 16. Each carries 3 scores

9) Let $f : [-1,1] \rightarrow R$ be defined by $f(x) = \frac{x}{x+3}$. Show that f is one one and onto. (4)

- 10) (i) Find the principal value of $\cos^{-1}\left(\frac{1}{2}\right)$ (1)
- (ii) Write $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right)$, $-\frac{3\pi}{2} < x < \frac{\pi}{2}$ in simplest form. (3)
- 11) (i). Construct a 2X2 matrix whose elements are given by $a_{ij} = \frac{i}{j}$ (1)
- (ii). If $X+Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and $X-Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$. Find X and Y (3)
- 12) Find the area of the ellipse $\frac{x^2}{16} + \frac{y^2}{9} = 1$ (4)
- 13) (i) Find the order and degree of the differential equation
- $$\frac{d^2y}{dx^2} - 5\left(\frac{dy}{dx}\right)^2 - 6y = \log x$$
- (1)
- (ii) Solve the differential equation $\frac{dy}{dx} + \frac{y}{x} = x^2$ (3)
- 14) Find a unit vector perpendicular to each of the vector $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$
where $\vec{a} = 3\hat{i} + 2\hat{j} + 2\hat{k}$ and $\vec{b} = \hat{i} + 2\hat{j} - 2\hat{k}$ (4)
- 15) Find the shortest distance between the lines
 $\hat{r} = 2\hat{i} + \hat{j} + \lambda(2\hat{i} - \hat{j} + \hat{k})$ and $\hat{r} = 2\hat{i} - \hat{j} - \hat{k} + \mu(3\hat{i} + \hat{j} - \hat{k})$ (4)
- 16) A husband and a wife appear for an interview for the vacancies of the same post.
If the probability of husband's selection is $\frac{1}{7}$ and that of wife's selection is $\frac{1}{5}$. If both tried to solve the problem independently, what is the probability that
- (i). both of them selected (1)
- (ii). None of them selected (1)
- (iii). Exactly one of them selected. (2)

Answer any 3 questions from 17 to 20. Each carries 6 scores

- 17) Solve the following system of linear equation by Matrix method
- $$2x+3y+3z = 5$$
- $$x-2y+z = -4$$
- $$3x-y-2z = 3$$
- (6)

18) (i). Find the value of k if the function $f(x) = \begin{cases} kx^2, & x \leq 3 \\ 4, & x > 3 \end{cases}$ is continuous at $x = 3$ (2)

(ii) Differentiate $x^{\sin x}$, $x > 0$ w.r.t x (2)

(iii) Find $\frac{dy}{dx}$ if, $x = a(\theta + \sin \theta)$, $y = a(1 - \cos \theta)$ (2)

19) Evaluate

(i). $\int \frac{x+3}{x^2-2-5x} dx$ (4)

(ii) $\int_0^{\frac{\pi}{2}} \cos^2 x dx$ (2)

20) Maximise $Z = 5x+3y$

Subject to $3x+5y \leq 15$

$$5x+2y \leq 10$$

$$x, y \geq 0 \quad (6)$$

Prepared by : Tirur Sub District , Malappuram

SL.NO	NAME	PEN	SCHOOL
1	ZAKEER HUSAIN	412012	GHSS PURATHUR
2	MAHESH T	913302	GGHSS BP ANGADI
3	VIJU T	911989	GHSS EZHUR
4	DARSANA M	691852	GHSS PERASANNUR
5	ANNEY VARKEY	233851	NMHSS THIRUNNAVAYA
6	JEWEL ELSA THOMAS	912358	GHSS ATHAVANAD
7	SAFIYA P T		MARKAZ HSS ATHAVANAD
8	HISHAM V		IRHSS POOKATTIRI