SECOND YEAR HIGHER SECONDARY
MODEL QUESTION PAPER

Time: 2 Hr.

MATHEMATICS
PART III

Maximum mark: 60

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

1. Check whether the relation R on R defined by $R = \{(a, b) : a \leq b^2\}$ is reflexive, symmetric or transitive. (3)

2. Express $\begin{bmatrix} -1 & 4 & -6 \\ 8 & 5 & 16 \\ 2 & 8 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrices (3)

3. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ show that $A^2 - 5A + 7I = 0$ (3)

4. Solve $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ (3)

5. i) Find $\int_0^{\pi/2} \frac{\sin x}{\sin x + \cos x} \, dx$ (2)

ii) Find the integrating factor of $\frac{dy}{dx} + \frac{y}{x} = x^2$ (1)

6. Find the area of the parallelogram whose adjacent sides are $2\hat{i} - 4\hat{j} + 5\hat{k}$ and $\hat{i} - 2\hat{j} - 3\hat{k}$ (3)

7. Find the angle between the lines

$$\frac{x-2}{2} = \frac{y-1}{5} = \frac{z+3}{-3} \text{ and } \frac{x+2}{-1} = \frac{y-4}{8} = \frac{z-5}{4}$$ (3)

8. Probability of solving specific problems independently by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problems independently, what is the probability that the problem is solved. (3)

Answer any six questions from 9 to 16. Each carries 4 scores.

9. i) P.T the function $f: R \to R$ defined by $f(x) = 7 - 8x$ is one-one. (2)

ii) Match the following function defined from R to R

Sin x	one-one not onto
x^3	one-one and onto
	neither one-one nor onto

(2)

10. i) Find the principal solution of $\cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ (1)

ii) Simplify $\tan^{-1}\left(\sqrt{\frac{1-\cos x}{1+\cos x}}\right)$, $x < \pi$ (3)

11. i) Construct a 2x2 matrix $[a_{ij}]$ where $a_{ij} = \frac{(i+j)^2}{2}$ (2)

ii) Find the values of x, y and z if

$$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$$

(2)

12 i) $\int \frac{x}{(x+2)(x+3)}\, dx$ (2)

ii) $\int \frac{e^{\tan^{-1}x}}{1+x^2}\, dx$ (2)

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

17. Solve the system of equations by matrix method.

$$x - y + 2z = 7$$
$$3x + 4y + 5z = -5$$
$$2x - y + 3z = 12$$

(6)

18. a) Find value of k if $f(x) = \begin{cases} kx+1, & x \leq 5 \\ 3x-5, & x > 5 \end{cases}$ is continuous at $x = 5$ (2)

b) Find $\frac{dy}{dx}$ (2)

i) $x^2 + xy + y^2 = 100$ (2)

ii) $(\log x)^{\sin x}$

19. a) Find the interval in which the function $f(x) = \sin x + \cos x$, $0 \leq x \leq 2\pi$ is increasing or decreasing (3)

b) Find 2 positive numbers x and y whose sum is 16 and sum of whose cubes is minimum. (3)

20. Minimize $Z = -3x + 4y$

Subject to $x + 2y \leq 8$, $3x + 2y \leq 12$

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

13. Find the area of the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ (4)

14. i) Find the unit vector perpendicular to
$\vec{a} = 2\hat{i}+\hat{j}+3\hat{k}$ and
$\vec{b} = 3\hat{i}+5\hat{j}-2\hat{k}$ (2)

ii) Find the projection of the vector $\hat{i}+3\hat{j}+7\hat{k}$ on $7\hat{i}-\hat{j}+8\hat{k}$ (2)

15. Find the shortest distance between the lines
$\vec{r} = (\hat{i}+2\hat{j}+\hat{k})+d(\hat{i}-\hat{j}+\hat{k})$ and
$\vec{r} = (2\hat{i}-\hat{j}+\hat{k})+\mu(2\hat{i}+\hat{j}+2\hat{k})$ (4)

16. An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probability of an accidents are 0.01, 0.03 and 0.15 respectively. One of the insured person meets with an accident, What is the probability that he is a scooter driver. (4)

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3. Smitha.C.V SMCHSS S. Bathery
4. Shiju. Joy GVHSS Ambalavayal
5. Muhammadali GHSS Vythiri
6. Kadeeja. K.A WOVHSS Muttil
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8. Kavitha. R GHSS Kakkavayal