

MATHEMATICS

Model Examination 2012

Time : $2\frac{1}{2}$ Hours

Cool off time : 15 Minutes

Maximum : 80 Score

1. Let $A = \{1,2\}$, $B = \{1,2,3,4\}$ and $C = \{5,6\}$ (a) Find $A \times B$ and $A \cap C$ (2)(b) Verify $A \times (B \cap C) = (A \times B) \cap (A \times C)$ (4)2. (a) Draw the graph of the function $f:R \rightarrow R$ defined by (2)

$$f(x) = \begin{cases} 1 & \text{if } x > 0 \\ 0 & \text{if } x = 0 \\ -1 & \text{if } x < 0 \end{cases}$$

(b) Let $f(x) = x^2$ $g(x) = 2x+1$ be two real functions.find $(f+g)(x)$, $(f-g)(x)$, $(fg)(x)$ (3)

3. (a) Match the following (2)

A	B
$\sin \frac{\pi}{2}$	$\sqrt{3}$
$\tan \frac{\pi}{6}$	0
$\operatorname{Cosec} 5\frac{\pi}{6}$	1
$\cot \frac{\pi}{6}$	2
	$\frac{1}{\sqrt{3}}$

(b) Prove that $\sin^2 \frac{\pi}{2} \cdot \cot^2 \frac{\pi}{6} + \operatorname{Cosec} 5\frac{\pi}{6} + 3 \tan^2 \frac{\pi}{6} = 6$ (3)4. Let $P(n):9^n - 1$ is divisible by 8, $n \in \mathbb{N}$ (a) Prove that $P(1)$ is true (1)(b) Assume $P(k)$ is true, Prove that $P(k+1)$ is true (3)5. Consider the complex number $Z = \frac{1+3i}{1-2i}$ (a) Express Z in the form $a+ib$ (2)(b) Express Z in the polar form (3)6. Solve the inequality $3(x-1) \leq 2(x-3)$ (2)

7. Solve the following system of inequalities graphically (4)

$$x + 2y \leq 8$$

$$2x + y \leq 8$$

$$x \geq 0$$

$$y \geq 0$$

8. (a) Find n if ${}^{n-1}P_3 : {}^nP_4 = 1 : 9$ (3)

(b) How many ways can a team of 4 boys and 3 girls can be selected from 5 boys and 4 girls (3)

OR

9. (a) if ${}^nC_8 = {}^nC_2$ find nC_2 (3)

(b) From a committee of 8 persons, in how many ways can we choose a chairman and a vice chairman assuming one person can not hold more than one position? (3)

10. Consider the expansion of $(\frac{3}{2}x^2 - \frac{1}{3x})^7$.

(a) The number of terms in the above expansion is..... (1)

(b) Find the general term and the middle terms in the above expansion. (3)

11. Consider the A.P $-6, -\frac{11}{2}, -5 \dots$

(a) Find the common difference. (1)

(b) Find the tenth term. (1)

(c) How many terms are needed to get the sum of terms -25. (3)

12. The sum of first 3 terms of a G.P is $\frac{13}{12}$ and their product is -1 .

(a) Find the common ratio. (2)

(b) Find the terms. (1)

13. Consider the line $3x-4y+8=0$

(a) Find its slop. (1)

(b) Find its x and y intercept. (2)

(c) Find the equation of a line which passes through $(2, -3)$ and parallel to the above line. (2)

14. Find the eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ (2)

15. Find the ratio in which the line joining (-1,2,3) and (2,4,-5) is divided by YZ plane (2)

16. (a) Evaluate $\lim_{\theta \rightarrow 0} \frac{\sin 4\theta}{\theta}$ (2)

(b) Find the derivative of $\cos x$ using the first principle (3)

OR

17. (a) Evaluate $\lim_{x \rightarrow 2} \frac{x^3 - 8}{x^2 - 4}$. (2)

(b) Find the derivative of $\frac{x \sin x}{1 + x^2}$. (3)

18. "If x and y are odd integers then xy is odd"

(a) Write the converse of this statement. (1)

(b) Write the contrapositive of this statement. (1)

19. Find the mean deviation about mean for the following data. (4)

x_i	5	10	15	20	25
f_i	7	4	6	3	5

20. Find the coefficient of variation of the following data (4)

6,7,10,12,13,4,8,12

21. Consider the random experiment of tossing 3 coins.

(a) Write the sample space (1)

(b) Let A : the event of getting exactly 2 heads ; B : the event of getting atleast 2 heads ,
be two events associated with the random experiment. Then,
Write $P(A)$, $P(B)$, $P(A \cap B)$ (3)

(c) Find $P(A \text{ or } B)$. (2)