



Date: 9/11/23
GRADE: XIIA

MONTHLY TEST -03 (2023-24)
MATHEMATICS [041]

Max marks: 20
Time: 50 Minutes

General Instructions:

- 1) Questions 1 to 4 carries 1 mark each.
- 2) Questions 5 to 8 carries 2 marks each.
- 3) Questions 9 and 10 carries 4 marks each.
- 4) All questions are compulsory.

SECTION A		
1	For what value of λ are the vectors $c = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $b = \hat{i} - 2\hat{j} + 3\hat{k}$ \perp to each other. a) $-\frac{5}{2}$ b) $\frac{5}{2}$ c) $\frac{3}{2}$ d) $-\frac{3}{2}$	1
2	Find the direction ratio of the line parallel to the line given by $6x - 2 = 3y + 1 = 2z - 2$ a) 1,1,1 b) 6,3,2 c) $\frac{1}{6}, \frac{1}{3}, \frac{1}{2}$ d) 2, -1, 2	1
3	Find unit vector in the direction of the vector $2\hat{i} + 3\hat{j} + \hat{k}$ a) $\frac{2\hat{i} + 3\hat{j} + \hat{k}}{\sqrt{6}}$ b) $\hat{i} + \hat{j} + \hat{k}$ c) $\frac{\hat{i} + \hat{j} + \hat{k}}{\sqrt{3}}$ d) $\frac{2\hat{i} + 3\hat{j} + \hat{k}}{\sqrt{14}}$	1
4	Evaluate : $\int \frac{e^{\tan^{-1}x}}{1+x^2} dx$ a) $e^{\tan^{-1}x} + c$ b) $\tan^{-1}x e^{\tan^{-1}x} + c$ c) $\tan^{-1}x + c$ d) None	1
SECTION B		
5	Evaluate $\int \frac{2x-3}{x^2+3x-18} dx$	2
6	Evaluate $\int \frac{1}{1+\cot x} dx$	2
7	Find the angle between the pair of the lines given by $\vec{r} = 3\hat{i} + 2\hat{j} - 4\hat{k} + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$ and $\vec{r} = 5\hat{i} - 2\hat{j} + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$.	2
8	Find the area of a triangle having the points A(1,2,3), B(2,-1,1) and C(-1,2,3) as its vertices using vector algebra.	2

SECTION C

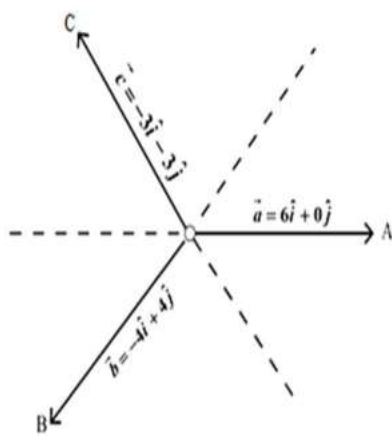
9. Read the following and answer any four questions: 4

Team A,B,C went for playing Tuf of war game. Team A,B,C have attached a rope to a metal ring and is trying to pull the ring into their own area.

Team A pulls with the force $F_1 = 6\hat{i} + 0\hat{j}$ kN

Team B pulls with the force $F_2 = -4\hat{i} + 4\hat{j}$ kN

Team C pulls with the force $F_3 = -3\hat{i} - 3\hat{j}$ kN



- i) What is the magnitude of the force of Team A?
- ii) Which team will win the game?
- iii) Find the magnitude of the resultant force exerted by the teams.

10. Read the following and answer any four questions: 4

The equation of motion of a missile are $x = 3t$, $y = -4t$, $z = t$, where the time t is in seconds, and the distance is measured in kilometres.



- (i) What is the path of the missile?
 a) Straight line b) Parabola c) Circle d) Ellipse

- (ii) Which of the following points lie on the path of the missile?
a) (6,8,2) b) (6,-8,-2) c) (6,-8,2) d) (-6,-8,2)
- (iii) At what distance will the rocket be from the starting point (0,0,0) in 5 seconds?
a) $\sqrt{550}$ km b) $\sqrt{650}$ km c) $\sqrt{450}$ km d) $\sqrt{750}$ km
- (iv) If the position of rocket at a certain instant of time is (5,-8 , 10), then what will be the height of the rocket from the ground?(The ground is considered as the xy-plane)
a) 12km b) 11 km c) 20km d) 10km

OR

10) Find the shortest distance between the lines

$$\vec{r} = \hat{i} + \hat{j} + \hat{\lambda}(2\hat{i} - \hat{j} + \hat{k}) \text{ and } \vec{r} = 2\hat{i} + \hat{j} - \hat{k} + \mu(3\hat{i} - 5\hat{j} + 2\hat{k})$$