No. of Printed Pages : 6

BET-011

DIPLOMA IN CIVIL ENGINEERING (DCLE(G))/ DIPLOMA IN MECHANICAL ENGINEERING (DME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI / ACCLEVI / ACMEVI / ACELVI / ACECVI / ACCSVI

00583

Term-End Examination

December, 2018

BET-011 : MATHEMATICS – I

Time : 2 hours *Maximum Marks : 70*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***four*** *questions out of the remaining questions. Use of scientific calculator is permitted.*

1. Choose the correct answer from the given four alternatives. (Answer any ***seven*** of the following) : *7×2=14*

(i) In Figure 1, $\angle AOB = 90°$, and $\angle ABC = 30°$, then $\angle CAO$ is equal to

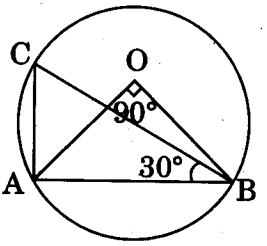

Figure 1

(a) 30°

(b) 45°

(c) 90°

(d) 60°

(ii) If $x = a \cos \theta + b \sin \theta$ and $y = a \sin \theta - b \cos \theta$, then $x^2 + y^2$ is equal to

(a) $a^2 + b^2$

(b) $a^2 - b^2$

(c) $b^2 - a^2$

(d) $a^2 + 2ab$

(iii) The angle between the vectors $2\hat{i} - 3\hat{j} + 5\hat{k}$ and $-2\hat{i} + 2\hat{j} + 2\hat{k}$ is

(a) $90°$

(b) $120°$

(c) $0°$

(d) $\tan^{-1} \frac{3}{4}$

(iv) A vector with magnitude zero is called

(a) free vector

(b) localised vector

(c) position vector

(d) null vector

(v) Coordinates of any point on the circle $x^2 + y^2 = a^2$ can be taken as

(a) $(\cos \theta, \sin \theta)$

(b) $(\sin \theta, \cos \theta)$

(c) $(a \cos \theta, a \sin \theta)$

(d) $(a \sin \theta, a \cos \theta)$

(vi) If a circle passes through (0, 0), (a, 0), and (0, b), then the co-ordinates of the centre are

(a) $\left(\frac{a}{2}, \frac{b}{2}\right)$

(b) $\left(\frac{b}{2}, \frac{a}{2}\right)$

(c) (a, b)

(d) (b, a)

(vii) The vertex of the parabola $y^2 + 6x - 2y + 13 = 0$ is

(a) $(1, -1)$

(b) $(-2, 1)$

(c) $\left(\frac{3}{2}, 1\right)$

(d) $\left(-\frac{7}{2}, 1\right)$

(viii) The length of the latus rectum of the parabola $y^2 = 8x$ is

(a) 1

(b) 8

(c) 2

(d) 4

(ix) The roots of the equation $x^2 - 8x + 12 = 0$

(a) (2, 6)

(b) (3, 6)

(c) (6, 4)

(d) None of these

(x) If the roots of $px^2 + qx + 2 = 0$ are reciprocal to each other then

(a) $p = 0$

(b) $p = -2$

(c) $q = 0$

(d) $p = 2$

2. (a) Find out the 16^{th} term of the arithmetic sequence of the series

4, 7, 10, ...

Also compute the sum of series up to the 16^{th} term.

(b) A geometric sequence has first term 3 and last term 48. If each term is twice the previous term, find the number of terms and the sum of the geometric sequence.

(c) If x, y, z are the p^{th}, q^{th}, and r^{th} term of an AP and a GP, then prove that *4+5+5*

$$x^{y-z} \cdot y^{z-x} \cdot z^{x-y} = 1$$

3. (a) If $\vec{a} = 2\hat{i} + 2\hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2\hat{j} + \hat{k}$, and $\vec{c} = 3\hat{i} + \hat{j}$ are such that $\vec{a} + \lambda\vec{b}$ is perpendicular to $\vec{c}$, then find the value of λ.

(b) If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular.

(c) Find a vector of magnitude 5 units, and parallel to the resultant of the vectors

$\vec{a} = 2\hat{i} + 3\hat{j} - \hat{k}$, and

$\vec{b} = \hat{i} - 2\hat{j} + \hat{k}$. *4+5+5*

4. (a) Prove that

$$\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \operatorname{cosec} A + \cot A$$

(b) The breadth of a street between two houses is 9 m and the the angle of depression of the top of one as observed from the top of the other which is 12 m high, is 30°. Find the height of the other house.

(c) Find the equation of the line cutting off an intercept –3 from y-axis and inclined at 120° to x-axis. *4+5+5*

5. (a) Find the eccentricity of the ellipse

$$\frac{x^2}{64} + \frac{y^2}{28} = 1$$

(b) Find the focus and the equation of the directrix of parabola whose equation is $y^2 = 8x$.

(c) Compute the value of x, if

$$2\log(x + 1) - \log(x^2 - 1) = \log 2$$ *4+5+5*

6. (a) Calculate the co-efficient of x_{10}^{16} in the expansion of $(x^2 - 2x)$.

(b) One end of a diameter of the circle $x^2 + y^2 - 3x + 5y - 4 = 0$ is (2, 1). Find the co-ordinates of the other end.

(c) Compute the value of n, if in the expansion of $(1 + ax)^n$, the first three terms are $1 + 12x + 64x^2$. *4+5+5*
