

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

Term-End Examination

00913

June, 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) : $7 \times 2 = 14$

(i) In Figure 1, if $OA = 5$ cm, $AB = 8$ cm, and OD is perpendicular to AB , then CD is equal to

- (a) 2 cm
- (b) 3 cm
- (c) 4 cm
- (d) 5 cm

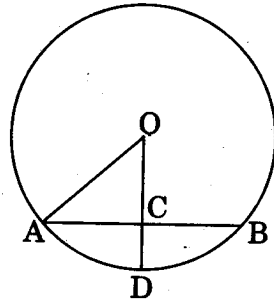


Figure 1

(ii) $\cos 60^\circ + \sin 30^\circ + \cos^2 30^\circ$ is equal to

(a) $\frac{7}{4}$

(b) $\frac{4}{7}$

(c) $\frac{6}{7}$

(d) $\frac{2\sqrt{3}}{21}$

(iii) If $\sin(A - B) = \frac{1}{2}$ and $\sin A = \frac{1}{\sqrt{2}}$, then the

angles A and B respectively are

(a) $15^\circ, 45^\circ$

(b) $45^\circ, 15^\circ$

(c) $30^\circ, 60^\circ$

(d) $60^\circ, 30^\circ$

(iv) Which of the following is **not** an example of a scalar quantity ?

(a) Work

(b) Force

(c) Power

(d) Time

(v) The gradient of a line parallel to y-axis is

(a) 1

(b) 0

(c) ∞

(d) None of these

- (vi) The area of the circle having centre at (1, 2) and passing through (4, 6) is
- (a) 5π
 - (b) 10π
 - (c) 25π
 - (d) None of these
- (vii) The focus of the parabola $(y - 1)^2 = 12(x - 2)$ is
- (a) (2, 1)
 - (b) (1, -1)
 - (c) (5, 1)
 - (d) (3, 0)
- (viii) The latus rectum of the ellipse $5x^2 + 9y^2 = 45$ is
- (a) $\frac{5}{3}$
 - (b) $\frac{10}{3}$
 - (c) $\frac{2}{3}\sqrt{5}$
 - (d) $\frac{\sqrt{5}}{3}$
- (ix) The number of roots of the equation $\frac{(x+2)(x-5)}{(x-3)(x+6)} = \frac{x-2}{x+4}$ is
- (a) 3
 - (b) 2
 - (c) 1
 - (d) 0

(x) When three times a certain number is added to twice its reciprocal, the result is 5. Find the number.

(a) 1 and $\frac{2}{3}$

(b) 1 only

(c) $\frac{2}{3}$ only

(d) None of these

2. (a) The arithmetic mean of two numbers is 34 and geometric mean is 16. What are the numbers ?

(b) Three numbers are in the ratio 2 : 5 : 7. If 7 is subtracted from the second, the resulting numbers form an arithmetic sequence. Determine the original numbers.

(c) The sum of first three terms of a GP is 26 and the sum of first six terms of the GP is 728. What is the common ratio and the first term of the GP ?

$$4+5+5$$

3. (a) Find a vector in the direction of vector $\vec{a} = \hat{i} - 2\hat{j}$ that has magnitude 7 units.

(b) Find the projection of the vector

$$\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k} \text{ on the vector}$$

$$\vec{b} = \hat{i} + 2\hat{j} + \hat{k}.$$

- (c) Find a unit vector perpendicular to each of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$, where

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

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

4. (a) If $\cos \theta = \frac{3}{5}$, then find the value of

$$\frac{\sin \theta \tan \theta + 1}{2 \tan^2 \theta}.$$

- (b) Prove that

$$\frac{\sin \theta}{1 - \cot \theta} + \frac{\cos \theta}{1 - \tan \theta} = \sin \theta + \cos \theta.$$

- (c) Find out the equation of the straight line passing through (1, 2) and perpendicular to $x + y + 7 = 0$. 4+5+5

5. (a) Find out the equation of the circle through the point (4, 5) and having centre at (2, 2).

- (b) Find the vertex, focus and directrix of the parabola $(y + 3)^2 = 2(x + 2)$.

- (c) Find the foci of the ellipse

$$25x^2 + 9y^2 - 150x - 90y + 225 = 0. \quad 4+5+5$$

6. (a) Find the coefficient of x^4 in

$$\left(\frac{x}{2} - \frac{3}{x^2}\right)^{10}.$$

- (b) Find the coefficient of the term independent of x in the expansion of

$$\left(\sqrt{\frac{x}{3}} + \frac{3}{2x^2}\right)^{10}.$$

- (c) If the coefficient of x^7 and x^8 in $\left(2 + \frac{x}{3}\right)^n$ are equal, then find out the value of n . 4+5+5
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