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BET-011

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

00652

Term-End Examination

June, 2019

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. *7×2=14*

(i) The value of $(1 + \tan^2 30°)$ is

(a) 3

(b) $\frac{1}{3}$

(c) $\frac{1}{\sqrt{3}}$

(d) $\frac{4}{3}$

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

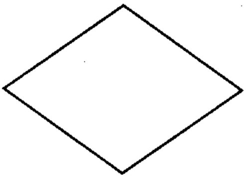
(a) 15°; 45°

(b) 45°; 15°

(c) 30°; 60°

(d) 60°; 30°

(iii) What is the meaning of the following shape in a flow chart ?



(a) Terminal box

(b) Input/Output box

(c) Decision box

(d) Calculation/Assignment box

(iv) The points of intersection of the parabola $y^2 = 4x$ and the straight line $x = 4$ are

(a) (2, 3), (4, 4)

(b) (3, 4), (4, 4)

(c) (4, 5), (4, 4)

(d) (4, 4), (4, – 4)

(v) The shortest distance of the point P (1, – 3) from the line $2y - 3x = 4$ is

(a) 13

(b) $\frac{7}{13}\sqrt{13}$

(c) $\sqrt{13}$

(d) None of the above

(vi) $\vec{A} \times \vec{B}$ is a vector

(a) perpendicular to $\vec{A}$

(b) perpendicular to $\vec{A}$ and $\vec{B}$ both

(c) parallel to $\vec{A}$

(d) parallel to $\vec{B}$

(vii) $\tan^{-1}(\tan \frac{3\pi}{4})$ is equal to

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

(b) $-\frac{\pi}{4}$

(c) $\frac{3\pi}{4}$

(d) None of the above

2. (a) Determine 'x' so that 2 is the slope of the line through

$$(2, 5) \text{ and } (x, 3).$$

(b) Determine the vertex and the focus of the parabola

$$y^2 - 4y - 4x - 8 = 0.$$

(c) Compute the value of x, if

$\log (7x - 13) = \log (x + 1) + \log 3.$ *4+5+5*

3. (a) Prove that the two circles

$x^2 + y^2 - 2x - 4y = 0$, and $x^2 + y^2 - 8y - 4 = 0$

touch internally.

(b) If ${}^{n}_{r}C + {}^{n}_{r+1}C = {}^{n+1}_{x}C$, then find x.

(c) Find the value of $\log \frac{9}{8} - \log \frac{27}{32} + \log \frac{3}{4}$.

4+5+5

4. (a) If $x = a \cos \theta + b \sin \theta$, and

$y = a \sin \theta - b \cos \theta$, then prove that

$x^2 + y^2 = a^2 + b^2$.

(b) If $\sec \theta + \tan \theta = 1 + \sqrt{2}$, then find the value of $\sec \theta$.

(c) If $\frac{3 + 5 + 7 + \ldots \text{ up to n terms}}{5 + 8 + 11 + \ldots \text{ up to n terms}} = 7$, find the value of n. *4+5+5*

5. (a) Find the projection of the vector $2\hat{i} + 3\hat{j} - 2\hat{k}$ on the vector $\hat{i} + 2\hat{j} - 3\hat{k}$.

(b) The vectors $\vec{A} = 3\hat{i} - \hat{k}$, and $\vec{B} = \hat{i} + 2\hat{j}$ are adjacent sides of a parallelogram. Find the area of the parallelogram.

(c) Prove that

$$\frac{1}{\log_{xy} xyz} + \frac{1}{\log_{yz} xyz} + \frac{1}{\log_{zx} xyz} = 2.$$ 4+5+5

6. (a) If $\frac{\sqrt{5}-1}{\sqrt{5}+1} - \frac{\sqrt{5}+1}{\sqrt{5}-1} = a + b\sqrt{5}$, find a and b.

(b) If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, show that $xyz = 1$.

(c) Find two geometric means between 3 and 192. 4+5+5

7. (a) Find the equation of a line passing through the point (2, 2) and sum of the intercepts on the axis is 9.

(b) The sum of first three terms of a GP is 26 and the sum of first six terms is 728. What is the n^{th} term of the geometric sequence ?

(c) Find the eccentricity, foci, length of the latus rectum of the ellipse $x^2 + 4y^2 - 4x + 24y + 31 = 0$. 4+5+5
