

DIPLOMA IN CIVIL ENGINEERING (DCLE(G))
/DIPLOMA IN MECHANICAL ENGINEERING
(DME)

DCLEVI/DMEVI/DELVI/DECVI/DCSVI/
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Term-End Examination

December, 2013

BET-011 : MATHEMATICS-I

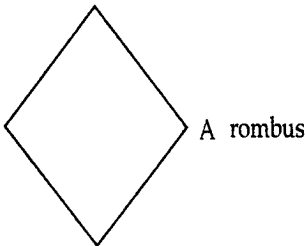
Time : 2 hours

Maximum Marks : 70

Note : Question No. 1 is compulsory. Attempt any four questions out of the remaining. Use of scientific calculator is permitted.

1. Answer any seven of the following : 2x7=14

- (a) Find the value of λ s.t $|\lambda \vec{a}|=1$ where \vec{a} is a non-zero vector.
- (b) In flow chart, what is the meaning of the following shape.



- (c) Simplify $\frac{\sqrt{3}-1}{\sqrt{3}+1}$
- (d) Find the characteristics of the logarithms of 0.003741.
- (e) Insert Six Arithmetic means between 2 and 16.
- (f) Find the middle term in the expansion of $\left(3x - \frac{x^3}{6}\right)^7$.
- (g) Find the principal value of $\operatorname{cosec}^{-1}(-1)$
- (h) Find the equation of a line with slope 3 and y -intercept 2.
- (i) Find the co-ordinates of the centre and radius of the circle whose equation is $x^2 + y^2 - 12x + 6y + 45 = 0$
- (j) Find the equation of a hyperbola whose focus is $(1, 2)$, eccentricity = $\sqrt{3}$ and directrix is $2x + y = 1$

2. (a) $x = \frac{\sqrt{3} + \sqrt{2}}{\sqrt{3} - \sqrt{2}}, y = \frac{\sqrt{3} - \sqrt{2}}{\sqrt{3} + \sqrt{2}}$ 5, 4, 5

Find the value of $x^2 + xy + y^2$.

(b) Evaluate : $\log_{81} 27$

(c) If α, β are the roots of the quadratic equation $ax^2 + bx + c = 0$, $a \neq 0$, Find the

value of $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2}$

3. (a) Find the sum of 19 terms of an A.P whose n^{th} term is $2n + 1$ 4, 5, 5

(b) If the first term of a G.P exceeds the second term by 2, and the sum of infinite terms is 50, Find the G.P

(c) If a, b, c are in G.P, show that $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are also in G.P

4. (a) Using binomial theorem, prove that $6^n - 5n$ always leaves the remainder 1 when divided by 25. 5,4,5

(b) Find the value of $\sin^2(-300^\circ)\cos^3(120^\circ) + \cos^2(-240^\circ)\sin^3(390^\circ)$

(c) Show that $\tan x + \tan 2x + \tan 3x = -\tan x \tan 2x \tan 3x$

5. (a) The angle of elevation of a tower from a point A due south of it is x and from a point B due east of A is y . If $AB = l$, show that h , the height of the tower is given by $h^2(\cot^2 y - \cot^2 x) = l^2$ 6, 4, 4

(b) Prove that

$$\cos(\sin^{-1}x) = \sin(\cos^{-1}x) = \sqrt{1-x^2}, |x| \leq 1.$$

(c) Find the equation of the lines which pass through (4, 5) and make an angle 45° with the line $2x + y + 1 = 0$

6. (a) Find the equations of the tangents to the circle $x^2 + y^2 = 9$ and which are parallel to $3x + 4y = 0$ 5,4,5

(b) Find the co-ordinates of the vertex, focus, length of the latus rectum, equation of the directrix of the parabola $2x^2 = -7y$.

(c) Find the focal distance of the point $P(5, 4\sqrt{3})$ on the ellipse $16x^2 + 25y^2 = 1600$

7. (a) Compute : 5,4,5

$$\left[\left(\vec{i} - \vec{j} + \vec{k} \right) \times \left(2\vec{i} - 3\vec{j} - \vec{k} \right) \right] \times \left[-3\vec{i} + \vec{j} + \vec{k} \right]$$

(b) Find the scalar m so that the vectors $2\vec{i} + \vec{j} - m\vec{k}$ is perpendicular to the sum of the vectors $\vec{i} + \vec{j} + 2\vec{k}$ and $3\vec{i} + 2\vec{j} + \vec{k}$

(c) Show by vector method that the diagonals of a rhombus are at right angles.