No. of Printed Pages : 4

BET-011

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

Term-End Examination

June, 2014

02000

BET-011 : MATHEMATICS – I

Time : 2 hours *Maximum Marks : 70*

Note : *Question number 1 is* ***compulsory****. Attempt any* ***four*** *more questions out of the remaining questions numbered 2 to 6. Use of calculator is permitted.*

1. Answer any ***seven*** of the following : *2×7=14*

(a) The smallest positive integer n for which $(1 + i)^{2n} = (1 - i)^{2n}$ is

(i) 4

(ii) 8

(iii) 2

(iv) 12

(b) How many terms are there in the expansion of $[(2x + 3y)^2]^5$?

(i) 9

(ii) 10

(iii) 11

(iv) None of these

(c) In flow chart, what is the meaning of the  ?

(i) Terminal box

(ii) Input box

(iii) Output box

(iv) Connector box

(d) Find the angle between the vectors $\hat{i} - \hat{j}$ and $\hat{j} + \hat{k}$.

(e) If $\vec{a} = 11\hat{i} + 23\hat{j} + 41\hat{k}$, then find the value of $\vec{a} \times \vec{a}$.

(f) Write the 5^{th} term in the expansion of $(a - 5b)^7$.

(g) Show that $\sqrt{\frac{1 - \sin\theta}{1 + \sin\theta}} = \sec\theta - \tan\theta$.

(h) Principal value of $\sin^{-1}(1)$ is

(i) 1

(ii) -1

(iii) $\pi/2$

(iv) $-\pi/2$

(i) Find the centre and radius of the circle $2x^2 + 2y^2 = 18$.

(j) Find the equation of the circle whose centre is $(2, -1)$ and which passes through the point $(3, 6)$.

2. (a) Find the equation of the circle of radius 5, passing through the origin and having its centre on the y-axis. *4*

(b) Find the equation of a parabola having vertex at the origin, y-axis as the axis and passing through $(3, -9)$. *4*

(c) Find the equation of the straight line which makes equal intercepts on the axes and passes through the point $(3, -5)$. *6*

3. (a) Show that

$\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$ *4*

(b) From a tower 128 m high, the angle of depression of a car is 26° 10′. Find how far the car is from the tower. *6*

(c) Show that $\tan^{-1}\frac{1}{2} + \tan^{-1}\frac{1}{3} = \frac{\pi}{4}$. *4*

4. (a) If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$ and

$\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$, then find $\vec{a} \times \vec{b}$.

Further, verify that $\vec{a}$ and $\vec{a} \times \vec{b}$ are perpendicular to each other. *4*

(b) Find the value of α so that the angle between the two vectors $\hat{i} + \hat{k}$ and $\hat{i} - \hat{j} + \alpha\hat{k}$ may be $\left(\frac{\pi}{3}\right)$. *6*

(c) Two vectors $\vec{a}$ and $\vec{b}$ are such that $(\vec{a} + \vec{b}).(\vec{a} - \vec{b}) = 0$.

Show that

$|\vec{a}| = |\vec{b}|$. *4*

5. (a) The third term of an A.P. is 25 and the tenth term is –3. Find the first term and the common difference. *6*

(b) Find the sum to n terms of the sequence

$1, -1, 1, -1, ..., (-1)^{n+1}, ...$ *4*

(c) Find the roots of the equation

$(x + 1)(x - 3) + 7 = 0$ *4*

6. (a) Find the two middle terms in the expansion of $\left(x^3 + \frac{1}{x^3}\right)^7$. *4*

(b) Use Binomial Theorem and expand $\left(x - \frac{1}{2x}\right)^5$. *6*

(c) Find the slope of the line through the points $(4, -6), (-2, -5)$. *4*