Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering
Term-End Examination
June, 2011
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 :   2x7=14

   (a) $4\sqrt[3]{2}$ is equal to

   (i) $\sqrt[3]{127}$ (ii) $\sqrt[3]{128}$

   (iii) $\sqrt[3]{129}$ (iv)   none of the above

   (b)   Roots of the equation
      $x^2 - i\,x + 6 = 0$ are
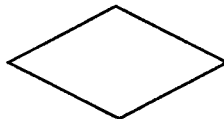   (i) $3i, -2i$ (ii) $-3i, 2i$
      (iii) $-3i, -2i$ (iv)   none of the above

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

(d) Find the middle term in the expansion of
$$\left(\frac{2a}{3} - \frac{3}{2a} \right)^6$$

(e) Prove that
$\sin\theta \cot\theta + \sin\theta \, \text{cosec}\,\theta = 1 + \cos\theta.$

(f) Find the coefficient of $\dfrac{1}{x^5}$ in the expression

of $\left(x - \dfrac{1}{2x} \right)^5$.

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

(h) Find the value of α so that

$\overrightarrow{A} = 2\hat{i} + \alpha\hat{j} + \hat{k}$ and

$\overrightarrow{B} = 4\hat{i} - 2\hat{j} - 2\hat{k}$ are perpendicular.

(i) Find the equation of the line through
$(-7, -4)$ with slope-2.

(j) $-\hat{k} \times \hat{i}$ is equal to

2. (a) Solve the equation $\sqrt{x + 4} = x - 2$ **4+4+6**

(b) Find the 17th term of the sequence
4, 6, 8, ...

(c) The fourth term of an A.P. is equal to 3 times
the first term and the seventh term exceeds
twice the third term by 1. Find the first term
and common difference.

3. (a) Prove that 4+4+

$$\sqrt{\frac{1 - \cos \theta}{1 + \cos \theta}} = \text{cosec } \theta - \cot \theta$$

(b) Prove that

$$\sin (45° + A) - \cos (45° - A) = 0$$

(c) If $\sin x + \sin^2 x = 1$ then find the value of $\cos^8 x + 2 \cos^6 x + \cos^4 \theta$.

4. (a) A town B is 13 km South and 18 km west of a tower A. Find the distance of town B from A. 6+4+

(b) Find k for which the distance between the points A (k, 2) and B (3, 4) is 8.

(c) Find the ratio in which the line joining the points $(-3, -4)$ and $(1, -2)$ is divided by the x-axis.

5. (a) Find the centre and radius of the circle 5+5

$$x^2 + y^2 + 4x - 4y - 1 = 0$$

(b) Find the equation of the ellipse whose foci are $(\pm 2, 0)$ and eccentricity is $\frac{1}{2}$.

(c) Find the length of the perpendicular from the point $(3, -2)$ to the straight line $12x - 5y + 6 = 0$

BET-011 3 P.T.

(a) If $\vec{A} \times \vec{B} = \vec{0}$ and $\vec{A}$ and $\vec{B}$ are not zero, 4+4+6

show that $\vec{A}$ is parallel to $\vec{B}$.

(b) If $\vec{A} = 2\hat{i} + 3\hat{j} - \hat{k}$ and

$\vec{B} = -\hat{i} + 4\hat{j} - 2\hat{k}$, find the projection of

$\vec{A}$ on $\vec{B}$.

(c) Evaluate

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