

05085

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

**DCLEVI/DMEVI/DELVI/DECVI/DCSVI/  
ACCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI**

**Term-End Examination**

**December, 2012**

**BET-011 : MATHEMATICS-I**

*Time : 2 hours*

*Maximum Marks : 70*

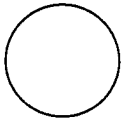
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*Note : Question No. 1 is compulsory. Attempt any four more questions out of the remaining questions. Use of calculator is permitted.*

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1. Answer *any seven* of the following : 2x7=14
- (a) Express  $3.4\sqrt{5}$  as a pure surd.
  - (b) Find the characteristics and mantissa of a number whose logarithm is 3.0784 and  $\bar{3}.0784$ .
  - (c) Find the value of k such that both the equations  $x^2 + kx + 64 = 0$  and  $x^2 - 8x + k = 0$  have real roots.
  - (d) Insert 4 Geometric means between 3 and 96.
  - (e) Find the 10<sup>th</sup> term of the A.P.  
-40, -15, 10, 35, .....

- (f) What is the meaning of the following box in a flow chart ?



- (g) Prove that :

$$\sin A = \frac{2 \tan \frac{A}{2}}{1 + \tan^2 \frac{A}{2}}$$

- (h) Find the perpendicular distance of the point (4, 1) from the line  $3x - 4y + 12 = 0$ .
- (i) Find the equation of the tangent to the circle  $x^2 + y^2 = 9$  at (3, 0).
- (j) Find a unit vector perpendicular to the vectors  $\vec{i}$  and  $\vec{j}$ .

2. (a) Evaluate the following without using the tables :

4, 4, 6

$$\frac{\cos 70^\circ}{\sin 20^\circ} + \frac{\cos 55^\circ \operatorname{cosec} 35^\circ}{\tan 5^\circ \tan 85^\circ \tan 45^\circ}$$

- (b) Prove that :

$$\frac{\sin \theta}{1 - \cos \theta} = \operatorname{cosec} \theta + \cot \theta$$

- (c) The horizontal distance between two towers is 140 m. The angle of elevation of the top of the first tower when seen from the top of the second tower is  $30^\circ$ .

If the height of the second tower is 60 m, find the height of the first tower.

3. (a) The sum of three consecutive numbers in A.P. is 18 and their product is 192. Find the numbers. 5,4,5
- (b) Using binomial theorem, evaluate  $(99)^5$ .
- (c) Simplify the surd

$$\frac{4}{2 + \sqrt{3} + \sqrt{7}}$$

4. (a) Find the equation of a line which passes through the point (2, 2) and the sum of the intercepts on the axis is 9. 5,4,5
- (b) Find the equation of a circle which is concentric with the circle :  
 $x^2 + y^2 - 4x + 6y - 3 = 0$  and which passes through the point (5, -2).
- (c) If A and B are two points (3, 4) and (5, -2), find the point P such that  $PA = PB$  and area of the triangle  $PAB = 10$ .

5. (a) Find the equation of a parabola whose focus is  $(1, 1)$  and the directrix is  $x + y + 1 = 0$ . 5,5,4
- (b) Find the centre, eccentricity and foci of the ellipse  $x^2 + 2y^2 - 2x + 12y + 10 = 0$ .
- (c) Solve the triangle ABC given  
 $a = 152$  cm,  $B = 53^\circ$ ,  $A = 80^\circ$ .

6. (a) Show that the points : 5,4,5

$$A\left(2\vec{i} + 4\vec{j} + \vec{k}\right), \quad B\left(4\vec{i} + 5\vec{j} + \vec{k}\right)$$

and  $C\left(3\vec{i} + 6\vec{j} - 3\vec{k}\right)$  form a right angled triangle.

- (b) Find a unit vector perpendicular to both the vectors  $\vec{A} = 2\vec{i} + \vec{j} - \vec{k}$  and  $\vec{B} = \vec{i} - \vec{j} + 2\vec{k}$
- (c) A particle acted by constant forces  $(4, 1, -3)$  and  $(3, 1, -1)$  is displaced from the point  $A(1, 2, 3)$  to the point  $B(5, 4, 1)$ . Find the work done by the forces on the particle.