04632

## Diploma in Civil Engineering / Diploma in Electrical & Mechanical Engineering

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

## Term-End Examination December, 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 scientific calculator is permitted.

1. Answer any seven of the following:

2x7 = 14

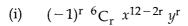
- (a) Evaluate  $2\hat{j} \times \hat{i} 3\hat{k}$ .
- (b) In flow chart, what is the meaning of the shape?



(c) Find the coefficient of  $x^5$  in the expression

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

(d) General term in the expansion of  $(x^2 - y)^6$ is:



(ii) 
$$(-1)^r {}^6C_r x^{12-r} y^r$$

(iii) 
$${}^{6}C_{r} x^{12-2r} y^{r}$$

- (iv) None of these
- The value of sin 120° is: (e)

(i) 
$$\frac{1}{2}$$
 (ii)  $-\frac{1}{2}$ 

(ii) 
$$-\frac{1}{2}$$

(iii) 
$$\sqrt{3}/2$$

$$\sqrt{3}/2$$
 (iv)  $-\sqrt{3}/2$ 

- (f) Find the slope of the line 4x + y - 5 = 0.
- Find the equation of a circle with centre (g) (3, -2) and touching the x - axis.
- (h) Find the equation of the parabola with vertex at origin and having its axis along the x - axis and passing through (1, -4).

(i) If 
$$\overrightarrow{A} = 2\hat{i} - 3\hat{j} - \hat{k}$$
 and  $\overrightarrow{B} = \hat{i} + 4\hat{j} - 2\hat{k}$ , find  $\overrightarrow{B} \times \overrightarrow{A}$ .

- (i)  $\sqrt[3]{3}$ 2 is equal to:
  - (i)  $3\sqrt[3]{4}$
- (ii)  $2\sqrt[3]{2}$
- (iii)  $2\sqrt[3]{4}$
- (iv) None of these

2. (a) Solve the equation : 
$$\sqrt{2x^2 - 2x + 1} = 2x - 3.$$

(b) For the A.P., 
$$a_1$$
,  $a_2$ ,  $a_3$ , ...., if: 
$$\frac{a_4}{a_7} = \frac{2}{3}$$
, find  $\frac{a_6}{a_8}$ .

- (c) If the 4<sup>th</sup> and 8<sup>th</sup> terms of a G.P. are 24 and 384 respectively, than find out the first term and the common ratio.
- 3. (a) Show that 5+4+5  $\sec\theta (1-\sin\theta) (\sec\theta + \tan\theta) = 1$ .
  - (b) Prove that  $\sin (45^{\circ} + A) \sin (45^{\circ} A) = \frac{1}{2} \cos 2A$ .
  - (c) If  $\tan \alpha = x + 1$ ,  $\tan \beta = x 1$ . Prove that  $2 \cot (\alpha - \beta) = x^2$ .
- 4. (a) A person, standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is 60°; when he retreats 40m from the bank, he finds the angle to be 30°, find the height of the tree and the breadth of the river. 6+4+4
  - (b) Find the ratio in which the line segment joining (2, -3) and (5, 6) is divided by x axis.
  - (c) Show that the triple points (-2, 5), (2, -3) and (0, 1) are collinear.

- 5. (a) Find the equation of the circle whose radius is 4 and which is concentric with the circle  $x^2 + y^2 + 2x 6y = 0$ . 5+4+5
  - (b) Find the equation of ellipse, whose major axis is 8 and  $e = \frac{1}{2}$ .
  - (c) Find the equation of a parabola whose focus is (1, 1) and the directrix is x + y + 1 = 0.
- 6. (a) If  $\overrightarrow{A} = 3\hat{i} \hat{j} + 2\hat{k}$ ,  $\overrightarrow{B} = 2\hat{i} + \hat{j} \hat{k}$  5+4+5and  $\overrightarrow{C} = \hat{i} - 2\hat{j} + 2\hat{k}$  find  $(\overrightarrow{A} \times \overrightarrow{B}) \times \overrightarrow{C}$ .
  - (b) Find the angle between  $\overrightarrow{A} = 2\hat{i} + 2\hat{j} \hat{k}$  and  $\overrightarrow{B} = 6\hat{i} 3\hat{j} + 2\hat{k}$
  - (c) Find the work done in moving an object from an initial point P (6, 3, 0) to the final point (9, 5, -5) if the applied force is  $\overrightarrow{F} = 2 \hat{i} \hat{j} \hat{k}.$