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**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 :

(i) $(-1)^r {}^6C_r x^{12-2r} y^r$

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

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

(iv) None of these

(e) The value of $\sin 120^\circ$ is :

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

(iii) $\frac{\sqrt{3}}{2}$ (iv) $-\frac{\sqrt{3}}{2}$

(f) Find the slope of the line $4x + y - 5 = 0$.

(g) Find the equation of a circle with centre $(3, -2)$ 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 $\vec{A} = 2\hat{i} - 3\hat{j} - \hat{k}$ and $\vec{B} = \hat{i} + 4\hat{j} - 2\hat{k}$,

find $\vec{B} \times \vec{A}$.

(j) $\sqrt[3]{32}$ 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 : 5

$$\sqrt{2x^2 - 2x + 1} = 2x - 3.$$

- (b) For the A.P., a_1, a_2, a_3, \dots , if : 4

$$\frac{a_4}{a_7} = \frac{2}{3}, \text{ find } \frac{a_6}{a_8}.$$

- (c) If the 4th and 8th terms of a G.P. are 24 and 384 respectively, then find out the first term and the common ratio. 5

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 $\vec{A} = 3\hat{i} - \hat{j} + 2\hat{k}$, $\vec{B} = 2\hat{i} + \hat{j} - \hat{k}$ 5+4+5
and $\vec{C} = \hat{i} - 2\hat{j} + 2\hat{k}$ find $\left(\vec{A} \times \vec{B}\right) \times \vec{C}$.
- (b) Find the angle between $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$
and $\vec{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$
- (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 $\vec{F} = 2\hat{i} - \hat{j} - \hat{k}$.
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