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BET-011

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

Term-End Examination

00690

June, 2016

BET-011 : MATHEMATICS – I

Time : 2 hours *Maximum Marks : 70*

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

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

(a) Verify that $\sqrt[4]{6}$ is a surd.

(b) If $\log_{10} 2 = 0{\cdot}30103$, evaluate $\log_{10}\left(\frac{1000}{256}\right)$.

(c) Find the root of the equation

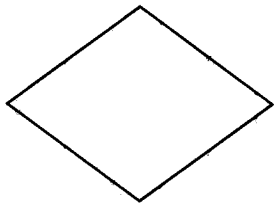
$$(x^2 - 5x)^2 - 30\,(x^2 - 5x) - 216 = 0.$$

(d) Find the 9^{th} term of the sequence

$$2, \; -6, \; 18, \; -54, \ldots$$

(e) Find the sum of 19 terms of an A.P. whose n^{th} term is $2n + 1$.

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



(g) Prove that

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

(h) Determine the equation of a line with slope 4 and intercept 2.

(i) Find the distance between the line $3x - 4y + 8 = 0$ and the point (2, 1).

(j) Which of the following is a scalar quantity ?

(i) Displacement

(ii) Kinetic energy

(iii) Velocity

(iv) Momentum

2. (a) In a right-angled triangle, the difference between two acute angles is $\pi/9$ in circular measure. Find the angle in degrees.

(b) Prove that

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

(c) A person standing on the bank of a river observes that the angle subtented by a tree on the opposite bank is 60°. When he moves away 100 m from the bank, he finds the angle to be 30°. Find the height of the tree and breadth of the river. *4+4+6*

3. (a) Find the sum of 50 terms of the sequence

$$7, 7{\cdot}7, 7{\cdot}77, 7{\cdot}777, \ldots$$

(b) Expand $\frac{1}{\sqrt[3]{6 - 3x}}$.

(c) Find the sum of the series

$$\frac{2}{9} + \frac{1}{3} + \frac{1}{2} + \ldots + \frac{81}{32}.$$ *5+4+5*

4. (a) Determine the equation of a line passing through the point $(-1, -2)$ and with slope $\frac{4}{7}$.

(b) Find the equation of a line perpendicular to the line $3x - 4y + 7 = 0$ and passing through the point $(-3, 2)$.

(c) Find the equation of a line which has a perpendicular segment of length 4 from the origin and the inclination of the perpendicular segment with positive direction of x-axis is 30°. *5+4+5*

5. (a) Determine the equation of a circle, if its centre is $(8, -6)$ and which passes through the point $(5, -2)$.

(b) Find the equation of the tangent to the circle $x^2 + y^2 = 9$ which is parallel to $3x + 4y = 0$.

(c) Find the equation of a parabola whose focus is $(3, 0)$ and the directrix is $3x + 4y = 1$.

4+5+5

6. (a) Show that the sum of three vectors determined by the medians of a triangle directed from the vertices is zero.

(b) Find the projection of 'b' on the line of 'a', if $a = \hat{i} + \hat{j} + \hat{k}$ and $b = 2\hat{i} + 4\hat{j} + 5\hat{k}$.

(c) Show that the vectors $A = \hat{i} - 5\hat{j}$ and $B = 2\hat{i} - 10\hat{j}$ are parallel to each other. *5+4+5*