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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

01062

December, 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) Prove that $\sqrt[3]{8}$ is not a surd.

(b) Find the seventh root of (0·0043).

(c) Solve the equation

$$3x^2 - 4x - 4 = 0.$$

(d) Find the 12^{th} term of the sequence

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

(e) If the third term of an AP is 18 and the seventh term is 30, find the series.

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

(g) Prove that

$2 \sin A \cos B = \sin (A + B) + \sin (A - B)$.

(h) Determine the equation of a line with slope 3 and intercept 2 at y-axis.

(i) The unit vector along $\hat{i} + \hat{j}$ is

(i) $\hat{k}$

(ii) $\hat{i} + \hat{j}$

(iii) $\frac{\hat{i} + \hat{j}}{\sqrt{2}}$

(iv) $\frac{\hat{i} + \hat{j}}{2}$

(j) Find the distance between the line

$3x - 4y + 12 = 0$ and the point (4, 1).

2. (a) Given $\cot \theta = \frac{12}{5}$, θ in the IIIrd quadrant, find the value of the other trigonometric functions.

(b) Prove that

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

(c) From the top of a cliff, 150 m high, the angles of depression of two boats which are due north of the observer are 60° and 30°. Find the distance between them. *4+4+6*

3. (a) Insert six arithmetic means between 2 and 16 and prove that their sum is 6 times the arithmetic mean between 2 and 16.

(b) Find the cube root of 127 up to four places of decimal.

(c) If the first term of a GP exceeds the second term by 2 and the sum of infinite terms is 50, find the GP. *4+5+5*

4. (a) Determine the equation of a line passing through the points (3, 4) and (2, –1).

(b) Find the equation of the line parallel to the y-axis and drawn through the point of intersection of $x - 7y + 5 = 0$ and $3x + y - 7 = 0$.

(c) Show that the lines

$$3x + 2y - 5 = 0$$

$$4x + 3y + 7 = 0$$

$$21x + 13y - 76 = 0$$

are concurrent. *4+5+5*

5. (a) Does $x^2 + y^2 - 12x + 6y + 45 = 0$ represent a circle ? If yes, find the radius and centre of the circle.

(b) Find the equation of the tangent and normal to the circle

$$x^2 + y^2 - 2x - 10y + 1 = 0$$

at the point $(-3, 2)$.

(c) Find the vertex, focus and directrix of the parabola

$$4y^2 + 12x - 12y + 39 = 0.$$ *4+5+5*

6. (a) If the sum of two unit vectors is a unit vector, prove that the magnitude of their difference is $\sqrt{3}$.

(b) Give a representation of work done by a force in terms of scalar product.

(c) Show that the vectors $A = 2\hat{i} - 3\hat{j} - \hat{k}$ and $B = -6\hat{i} + 9\hat{j} + 3\hat{k}$ are parallel. *5+4+5*