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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

01185

June, 2017

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) Given $\log_{10}2 = 0{\cdot}30103$, find the value of $\log_{10}5$.

(b) Find the n^{th} term of the G.P

$1, -1, 1, -1, \ldots$

(c) If $\tan\theta = 5$ and θ lies in the III^{rd} quadrant, find the value of $\sec\theta$.

(d) What is the meaning of the following shape in a flow chart ?

(e) Find the slope of the line joining (4, 5) and (4, – 7) if defined.

(f) Find the ratio in which P (– 8, 3) divides the line AB joining of A(2, – 2) and B(– 4, 1).

(g) Simplify

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

(h) Find the equation of a circle whose radius is 4 and is concentric with the circle

$$x^2 + y^2 + 2x - 6y = 0.$$

(i) The vertices of a Δ ABC are at the points

$$\vec{a} = 2\hat{i} - \hat{j} + \hat{k},\ \vec{b} = \hat{i} - 3\hat{j} + 5\hat{k},$$

$$\vec{c} = 3\hat{i} - 4\hat{j} - 4\hat{k}.$$

Show that Δ ABC is a right angled triangle at C.

2. (a) If one root of the quadratic equation

$2x^2 + kx - 6 = 0$ is 2, find the value of k and also the other root of the equation.

(b) Find the value of x if $x = (0{\cdot}0043)^{\frac{1}{7}}$.

(c) Find the middle terms in the expansion of

$$\left(3x - \frac{x^3}{6}\right)^7.$$

5+5+4

3. (a) The 9^{th} term of an A.P is zero. Show that the 29^{th} term is double the 19^{th} term.

(b) The sum of the first three terms of a G.P and the sum of the first six terms are in a ratio of 125 : 152. Find the common ratio of the G.P.

(c) The A.M between the numbers is 34 and G.M is 16. Find the two numbers. *4+5+5*

4. (a) What is the most general value of θ which satisfies both the following equations :

$$\sin\theta = \frac{1}{2}; \tan\theta = -\frac{1}{\sqrt{3}}.$$

(b) Prove that

$$(\sin\theta + \text{cosec}\,\theta)^2 + (\cos\theta + \sec\theta)^2 = 7 + \tan^2\theta + \cot^2\theta.$$

(c) If $\tan\theta = \frac{3}{4}$, find the value of $\frac{1-\cos\theta}{1+\cos\theta}$. *5+5+4*

5. (a) From the top of a hill, the angles of depression of two consecutive kilometre stones due east are found to be 30° and 45°. Find the height of the hill.

(b) Given a = 15, b = 36, c = 39 in triangle ABC, find the value of $\sin\frac{A}{2}$.

(c) Prove that $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right) = -\frac{\pi}{3}$. *6+5+3*

6. (a) A straight line passes through the point (2, 3) and the partition of the line intercepted between the axis is bisected at this point. Find the equation of the line.

(b) The line $4x + 3y + k = 0$ is a tangent to the circle $x^2 + y^2 = 4$. Find the value of k.

(c) Find the co-ordinates of a point on the parabola $y^2 = 8x$ whose focal distance is 4. *4+5+5*

7. (a) Find the equation of the hyperbola whose vertices are (0, 0), (10, 0) and one of the foci is (18, 0).

(b) Find the value of λ so that the vectors

$2\hat{i} - 3\hat{j} + 2\hat{k}$ and $5\hat{i} - \lambda\hat{j} + 3\hat{k}$

are perpendicular to each other.

(c) If $\vec{a} = \hat{i} - 2\hat{j} + 3\hat{k}$

$\vec{b} = 2\hat{i} + 3\hat{j} - 5\hat{k}$

find $\vec{a} \times \vec{b}$ and verify that a and $\vec{a} \times \vec{b}$ are perpendicular to each other. *5+4+5*
