

DipIETE – ET/CS (Current & New Scheme)

Time: 3 Hours

JUNE 2016

Max. Marks: 100

PLEASE WRITE YOUR ROLL NO. AT THE SPACE PROVIDED ON EACH PAGE IMMEDIATELY AFTER RECEIVING THE QUESTION PAPER.

NOTE: There are 9 Questions in all.

- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

a. The value of $\lim_{x \rightarrow 0} \frac{3^x - 2^x}{x}$ is :

(A) $\log(3^2)$

(B) $\log\left(\frac{3}{2}\right)$

(C) $\log\left(\frac{2}{3}\right)$

(D) $\log(2^3)$

b. If $f(x) = \sin(2x+5)$, then $f'(x)$ is

(A) $2 \sin(2x+5)$

(B) $5 \cos(2x+5)$

(C) $5 \sin(2x+5)$

(D) $2 \cos(2x+5)$

c. The value of $\int_0^{\pi/2} x \sin x dx$ is equal to

(A) 1

(B) $\pi/2$

(C) -1

(D) $-\pi/2$

d. If $\begin{bmatrix} x^2 & y \\ k & h \end{bmatrix} + \begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 5 & 5 \end{bmatrix}$, then values of 'x' are:

(A) ± 1

(B) ± 2

(C) ± 3

(D) 0, 1

- b. In a ΔABC , prove that: $(b+c)\cos A + (c+a)\cos B + (a+b)\cos C = a+b+c$ where A, B, C, a, b and c have their usual meanings. (8)
- Q.4** a. Find equation of line which pass through point of intersection of two lines: $2x+3y+5=0$ and $3x+4y-18=0$ and parallel to: $5x+2y+9=0$ (8)
- b. Find acute angle between two lines $2x-y+3=0$ and $x+y+2=0$. (8)
- Q.5** a. Find equation of circle concentric to circle $x^2+y^2-4x-6y-9=0$ and which passes through point $(-4,5)$ (8)
- b. Find equation of Ellipse with focus $(1, 1)$, directrix $3x+4y=5$ and eccentricity $\frac{1}{2}$. (8)
- Q.6** a. Find three consecutive terms in A.P. whose sum is 21 and sum of their squares is 155. (8)
- b. Find coefficient of x^{16} and that of mid term in the binomial expansion of $(2x^2-x)^{10}$ (8)
- Q.7** a. If A and B be two non-singular matrices of same order then show that: $(A \cdot B)^{-1} = B^{-1} \cdot A^{-1}$ and hence prove : $(A^{-1})^m = (A^m)^{-1}$ for any positive integer 'm'. (8)
- b. Test whether following equations are consistent, if found consistent then find the solution: $5x+3y+7z=4$; $3x+26y+2z=9$ and $7x+2y+10z=5$ (8)
- Q.8** a. Evaluate : $\int e^{ax} \cos bx \, dx$ (8)
- b. Show that: $\int_0^{\pi/2} \frac{dx}{a^2 \sin^2 x + b^2 \cos^2 x} = \frac{\pi}{2ab}$ (8)
- Q.9** a. If $x = \tan(\log y)$, then prove that: $(1+x^2)y_{n+1} + (2nx-1)y_n + n(n-1)y_{n-1} = 0$ where y_n , y_{n+1} and y_{n-1} are n^{th} , $(n+1)^{\text{th}}$ and $(n-1)^{\text{th}}$ derivatives of y. (8)
- b. Show that $f(x) = \sin x(1+\cos x)$ has maximum value at $x = \frac{\pi}{3}$ and find maximum value of f(x). (8)