Sample Question Paper – I

Course Code : All Branches of Diploma in Engineering and Technology

Course Code : AE/ME/PG/PT/FE/CE/CV/CS/CR/CH/CO/CM/CD/IF/EV/ET

9006

EN/DE/EJ/EX/EI/IE/IU/IS/IC/MU

Semester   : Second

Subject   : Engineering Mathematics

Max Marks   : 80   **Duration: 3 Hours**

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Instructions:
- All Questions are compulsory.
- Figures to the right indicate full marks.
- Assume suitable additional data if necessary.
- Non Programmable pocket calculator is allowed.

Q1. Attempt any Eight   **16 Marks**

a) If $f(x)=3x^2-5x+7$ Show that $f(-1)=3f(1)$

b) Test the function for odd or even if
   $F(x)=3x^4-2x^2+\cos x$

c) Evaluate $\displaystyle\lim_{x \to \infty}\left[1+\frac{1}{x}\right]^{3x}$

d) Find $\dfrac{dy}{dx}$ if y= sin(logx)

e) Find $\dfrac{dy}{dx}$ if y= (a^x+e^x)

f) Find $\dfrac{dy}{dx}$ if y=$e^x\tan x$

g) Find $\dfrac{dy}{dx}$ if y=$\dfrac{\tan^{-1}(x)}{1+x^2}$

h) Find the mean of the following data

x	4	7	10	13	16	19
f	7	10	15	20	25	30

i) The daily earning (in Rs) of 12 workers in a Workshop are
   16,19,12,14,13,17,16,19,20,15,16,13
   Find Mode and Median

j) If $P(A)=\dfrac{3}{5}$ $P(B')=\dfrac{3}{4}$ and $P(A\!/\!B)=\dfrac{4}{5}$
   Find P $(A\cap B)$ and P (B/A)

Q2. Attempt any Three   **12 Marks**

a) If f(x)= $\dfrac{1}{1-x}$ Show that f[f[f(x)]] = x

b) Evaluate $\displaystyle\lim_{x \to 0}\left[\dfrac{4^x + 4^{-x} - 2}{x\sin x}\right]$

c) Evaluate $\displaystyle\lim_{x \to 0}\left[\dfrac{1 - \cos^3 x}{\sin^2 (x)}\right]$

d) Evaluate $\displaystyle\lim_{x \to \infty}\left[\sqrt{x^2 + x} - x\right]$

Q3. Attempt any three   12 Marks

a) If y=a cos(logx) + bsin(logx) then
   Prove that
   $$x^2\dfrac{d2y}{dx^2} + x\dfrac{dy}{dx} + y = 0$$

b) Evaluate $\displaystyle\lim_{x \to a}\left[\dfrac{\sin x - \sin a}{x - a}\right]$

c) Calculate the Mean Deviation (M.D) about mean for the following data

Weight in (gm)	10-15	15-20	20-25	25-30	30-35	35-40	40-45
No. of items	7	12	16	25	19	15	06

d) A room has 3 electric lamps. From a collection of 15 electric bulbs of which only 10 are good,3 are selected at random and put in the lamps. Find the probability that the room is lighted by at least one of the bulbs.

Q4. Attempt any three   12 Marks

a) If x=a$(\cos\theta + \theta\sin\theta)$, y=a$(\sin\theta - \theta\cos\theta)$
   Find $\dfrac{dy}{dx}$

b) Find $\dfrac{dy}{dx}$ if y=$\cos^{-1}(2x^2-1)$

c) Find $\dfrac{dy}{dx}$ if $x^4 + y^4 = 4xy$

d) If $x^y = e^{x-y}$ Show that $\dfrac{dy}{dx} = \dfrac{\log x}{(1 + \log x)^2}$

Q5. Attempt any three   12 Marks

a) Find Median of the Following distribution

x	31-35	36-40	41-45	46-50	51-55	56-60	61-65
f	10	25	30	40	28	16	07

b) Find Mode graphically and Analytically for the following data

Expenditure in (Rs)	0-10	10-20	20-30	30-40	40-50
Frequency	14	23	27	21	15

c) Calculate the mean and Standard Deviation (S.D) of the following data

Class Marks	7	8	9	10	11	12	13
Frequency	4	6	9	12	9	6	4

d) A card is drawn at random from a pack of 52 cards. Find the probability that the card is an ace or a spade

Note : Q6. For Civil Electrical, Electronics, Mechanical groups

Q6. Attempt any Four   **16 Marks**
   a) If the distance traveled by the particle is given by $s=2t^3-9t^2+12t$. Calculate the acceleration when it stops.
   b) Find maximum and minimum value of $x^3+6x^2-15x+5$
   c) A telegraphic wire hangs in the form of a curve $y=a\log\sec(x/a)$ where a is constant.
   Show that the curvature at any point is $\dfrac{1}{a}\cos(\dfrac{x}{a})$
   d) Express $\dfrac{2+3i}{1-i}$ in the form A+iB Find its modulus and amplitude
   e) By using De-Moivre's theorem Simplify
   $$\dfrac{(Cos2\theta + i\sin 2\theta)(Cos\theta - i\sin\theta)^4}{(Cos3\theta + iSin3\theta)(Cos5\theta - i\sin 5\theta)^3}$$
   f) If $\cos(x-iy)=A+iB$ then prove that
   1] $\dfrac{A^2}{\cosh^2(y)} + \dfrac{B^2}{\sinh^2(y)}=1$
   2] $\dfrac{A^2}{\cos^2 x} - \dfrac{B^2}{\sin^2 x}=1$

Note : Q6. For Computer/Information Technology Group

Q6. Attempt any four   **16 Marks**
   a) Using Bisection method find approximate root of $x^2-12=0$ [carry out three iterations only]

   b) Using Regula Falsi method solve $x^3-9x+1=0$ [carry out three iterations only]

   c) Using Newton-Raphson method solve $x^3-5x+3=0$ [Carry out three iterations only]

   d) Using Gauss Elimination method solve
   2x+3y+2z=2
   10x+3y+4z=16
   3x+6y+z=-6

e) Using Jacobi's Method solve
   10x+2y+z=9
   2x+20y-2z=-44
   -2x+3y+10z=22 [carry out two iterations only]

f) Using Gauss –Seidal Method solve
   25x+6y-z=82
   6x+15y+5z=75
   x+y+40z=66 [carry out two iterations only]

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