3E1418

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B. Tech. (Sem. III) (Main/Back) Examination, January-2012

3AE6/ME6 Advanced Engineering Mathematics

Time : **3** Hours] [Total Marks : **80**

[Min. Passing Marks : **24**

Instructions to Candidates :

*Attempt any **five questions** selecting **one question** from each **unit**. All questions carry **equal** marks. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Use of following supporting material is permitted during examination.
(Mentioned in form No. 205)

1. Nil 2. Nil

UNIT - I

1 (a) Find the Fourier series for $f(x)=x^2$ in the interval $(-\pi,\pi)$.

(b) Find the Laplace inverse of the following :

$$\frac{4}{S-2}-\frac{3S}{S^2+16}+\frac{5}{S^2+4}$$

OR

1 (a) Find Fourier sine transform of $f(x)$:

$$f(x)=\begin{cases}1 & for, \quad 0<x<a\\ 0 & for \quad x>a\end{cases}$$

(b) find $f(x)$ if its cosine transform is e^{-as}

UNIT - II

2 Find Laplace of :

(a) $a+bt+ct^2$

(b) $e^{-4t}\cos h\,2t$

OR

2 (a) Find inverse Laplace transform of the function $\frac{1}{s}\cos\frac{1}{s}$

(b) $L[\cos h\,at\cos at]$

UNIT - III

3 Prove that the function $u=x^3-3xy^2+3x^2-3y^2+1$ satisfies Laplace equation and find corresponding analytic function.

OR

3 Expand $\frac{1}{z(z^2-3z+2)}$ in Laurentz series for the region

(a) $0<|z|<1$

(b) $1<|z|<2$

UNIT - IV

4 (a) A tightly stretched string with fixed end points $x=0$ and $x=l$ is initially in a position given by $y=y_o\ \sin^3\frac{\pi x}{l}$. If is released from rest from this position. Find the displacement $y(x,t)$.

(b) Prove that $x\,J_n'(x)=n\,J_n(x)-x\,J_{n+1}(x)$.

OR

4 (a) $x\,J_n'(x)=-n\,J_n(x)+x\,J_{n-1}(x)$

(b) $(2n+1)x\,P_n=(n+1)\,P_{n+1}+nP_{n-1}$.

UNIT - V

5 (a) The population of a town in the decimal census were as under. Estimate the population for the year 1925 :

Year x	1891	1901	1911	1921	1931
Population (in thousands) y	46	66	81	93	101

(b) Find $\Delta^6 (ax-1)(bx^2-1)(cx^3-1)$

OR

5 (a) Find $f(5)$ from the following table by using Lagrange's interpolation formula :

x	1	2	3	4	7
$f(x)$	2	4	8	16	128

(b) Use Simpson $\frac{1}{3}$ rule to calculate the following :

$$\int_0^1 \frac{2x}{1+x^2}.$$