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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Semester End Examination; Dec - 2017/Jan - 2018

Engineering Mathematics - III

(Common to all Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. Find the missing terms in the following table: 6

x	-0.2	0	0.2	0.4	0.6	0.8	1.0
y	2.6	-	3.4	4.28	-	14.2	29

b. A survey conducted in a slum locality reveals the following information as classified below: 7

Income Per day (Rs.)	Under 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of persons	20	45	115	210	115

Estimate the probable number of persons in the group 20 to 25.

c. Fit an interpolating polynomial for the data using Newton's divided difference formula; $u_0 = -5,\ u_1 = -14,\ u_4 = -125,\ u_8 = -21,\ u_{10} = 355$ and hence find u_2. 7

2 a. Find Lagrange's interpolating polynomial for the following data: $y(1) = 3,\ y(3) = 9,\ y(4) = 30,\ y(6) = 132$. 6

b. Given the data, 7

x	1	2	3	4	5
y	5	17	46	97	176

Find $y(3.2)$, by using Gauss forward formula.

c. Apply Bessel's formula to find y_{25} given that $y_{20} = 2854,\ y_{24} = 3162,\ y_{28} = 3544,\ y_{32} = 3922$. 7

UNIT - II

3 a. Compute $y''(1)$ for the function $y = f(x)$ given: 6

x	0	2	4	6	8	10
y	0	4	56	204	496	980

b. Find $y'(3)$ from the following data by using Newton's divided difference formula, 7

x	0	1	2	5
y	2	3	12	147

c. Find $y''(2)$ by using Stirling's formula given, 7

x	-1	1	3	5
y	-3	21	77	165

4 a. Evaluate $\int_0^1 \frac{dx}{1+x}$ by using Trapezoidal rule. Take seven ordinates. 6

b. Use Simpson's $1/3$rd rule to find $\int_0^{0.6} e^{-x^2} dx$ by taking six sub-intervals. 7

c. Evaluate $\int_{-\pi/2}^{\pi/2} \frac{dx}{2+\sin x}$ by using Weddle's rule by taking six equal parts. 7

UNIT - III

5 a. Obtain the Fourier series of the function $f(x)=x(2\pi-x)$ in $0\le x\le 2\pi$. 6

b. Obtain the Fourier series of the function,

$f(x)=x-x^2$ in $(-\pi,\pi)$. Deduce that $\frac{\pi^2}{12}=\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+......$ 7

c. Obtain the Fourier series of the function $f(x)=|x|$ in $(-l,l)$. Hence deduce that,

$\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+......$ 7

6 a. Obtain the complex Fourier series for the function $f(x)=e^x$ in $(0,2l)$. 6

b. Obtain the cosine half-range series of $f(x)=x\sin x$ in $0<x<\pi$. 7

c. Determine the constant term and first cosine and sine terms of the Fourier series expansion of the y from the following data: 7

x^o	0^o	45^o	90^o	135^o	180^o	225^o	270^o	315^o
y	2	$3/2$	1	$1/2$	0	$1/2$	1	$3/2$

UNIT - IV

7 a. Find the Fourier transform of $f(x)=xe^{-|x|}$. 6

b. Obtain the Fourier cosine transform of the function $f(x)=\begin{cases} 4x, & 0<x<1 \\ 4-x, & 1<x<4. \\ 0, & x>4 \end{cases}$ 7

c. Find the Fourier sine transform of $f(x)=e^{-|x|}$ and hence evaluate $\int_0^\infty \frac{x\sin mx}{1+x^2}dx$, $m>0$. 7

8 a. Obtain the Z-transform of $\cos n\theta$ and $\sin n\theta$. 6

b. Obtain the inverse Z-transform of $\frac{2z^2+3z}{(z+2)(z-4)}$. 7

c. Solve the difference equation $y_{n+2}+6y_{n+1}+9y_n=2^n$ with $y_0=0,\ y_1=0$ using Z-transforms. 7

UNIT - V

9 a. Form the partial differential equation by eliminating the arbitrary constant from the relation $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$. 6

b. Solve $x^2\frac{\partial u}{\partial x}+y^2\frac{\partial u}{\partial y}=0$ by the method of separation of variables. 7

c. Solve $(mz-ny)p+(nx-lz)q=ly-mx$. 7

10 a. Obtain the solution of the one dimensional heat equation $\frac{\partial u}{\partial t}=c^2\frac{\partial^2 u}{\partial x^2}$. 10

b. Solve the wave equation $\frac{\partial^2 u}{\partial t^2}=c^2\frac{\partial^2 u}{dx^2}$, given that $u(0,t)=0,\ u(l,t)=0,\ \frac{\partial u}{\partial t}=0$ when $t=0$ and $u(x,0)=u_0\sin\left(\frac{\pi x}{l}\right)$. 10

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