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

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. - Semester End Examination; Dec - 2016/Jan - 2017

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 values in the following table, 6

x	0	5	10	15	20	25
f(x)	6	10	-	17	-	31

b. Calculate the approximate value of y for $x = 0.54$ using the following table, 7

x:	0.5	0.7	0.9	1.1
y	0.47943	0.64422	0.78333	0.89121

c. By means of Newton's divided difference formula, find the value of $f(8)$ and $f(15)$ from the following table, 7

x	4	5	7	10	11	13
f(x)	48	100	294	900	1210	2028

2 a. Find the interpolating polynomial for (0, 2), (1, 3), (2, 12) and (5, 147), using Lagrange's interpolation formula. Hence find $f(1.5)$ and $f(6)$. 6

b. Use Gauss's forward formula to evaluate y_{30}, given that: $y_{21} = 18.4708$, $y_{25} = 17.8144$, $y_{29} = 17.1070$, $y_{33} = 16.3432$ and $y_{37} = 15.5154$. 7

c. Apply Bessel's formula to find the value of $f(27.5)$ from the table, 7

x	25	26	27	28	29	30
f(x)	4.000	3.846	3.704	3.571	3.448	3.333

UNIT - II

3 a. Compute $f'(15)$ and $f''(15)$ from the following table, 6

x	15	17	19	21	23	25
f(x)	3.873	4.123	4.359	4.583	4.796	5.0

b. Compute the values of $f'(3.1)$ and $f''(3.1)$ using Stirling's formula from the following table, 7

x	1	2	3	4	5
f(x)	0	1.4	3.3	5.6	8.1

c. Find the value of x for which y is maximum from the following data, 7

x	0	1	2	3	4	5
y	0	0.25	0	2.25	16	56.25

4 a. Compute: $\int_0^1 \frac{dx}{1+x^2}$ by dividing the interval into 8 equal parts, using trapezoidal rule. Hence obtain the value of π. 6

b. Compute: $\int_0^{0.3} \sqrt{1-8x^3}\,dx$ by taking of seven ordinates, using Simpson's $\left(\frac{3}{8}\right)^{th}$ rule. 7

c. Evaluate $\int_4^{5.2} \log_e x\,dx$ by Weddle's rule taking 7 ordinates. 7

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UNIT - III

5 a. Obtain the Fourier Series expansion of $f(x)=\left(\frac{\pi-x}{2}\right)^2$ in $0 \le x \le 2\pi$. 6

b. Given that: $f(x)=x+x^2$ for $-\pi < x < \pi$, find the Fourier expansion of $f(x)$. Deduce that $\frac{\pi^2}{6}=1+\frac{1}{2^2}+\frac{1}{3^2}+\ldots\ldots.$ 7

c. Find the Fourier series of $f(x)=\begin{cases}2, & -2 \le x \le 0\\ x, & 0 \le x \le 2\end{cases}$ also draw the graph of $f(x)$. 7

6 a. Obtain the Complex Fourier series for the function $f(x)=e^x$ $in(-l,\ l)$. 6

b. Find the Fourier half range-cosine series of the function: $f(x)=\begin{cases}2x, & 0<x<1\\ 2(2-x), & 1<x<2\end{cases}$ 7

c. Obtain the constant term and the coefficient of the first sine and cosine terms in the Fourier series of $f(x)$ as given in the following table, 7

x	0	1	2	3	4	5
f(x)	9	18	24	28	26	20

UNIT - IV

7 a. Find the Fourier transform of, $f(x)=\begin{cases}a-|x|, & \text{for } |x|\le a\\ 0, & \text{for } |x|>a\end{cases}$ 6

b. Solve the integral equation, $\int_0^\infty f(\theta)\cos\alpha\theta\, d\theta=\begin{cases}1-\alpha, & 0\le\alpha\le 1\\ 0, & \alpha>1\end{cases}$ 7

Hence evaluate: $\int_0^\infty \frac{\sin^2 t}{t^2}dt$.

c. Find the cosine transform of, $f(x)=\begin{cases}x, & 0<x<1\\ 2-x, & 1<x<2\\ 0, & x>2\end{cases}$ 7

8 a. Obtain the Z-transform of, i) $(n-1)^2$ ii) $(n+1)^3$, using suitable shifting rules. 6

b. Find the inverse Z-transform of, $\frac{4z^2-2z}{z^3-5z^2+8z-4}$. 7

c. Solve the difference equation, using Z-transforms, $y_{n+2}-5y_{n+1}+6y_n=2$ with $y_0=3,\ y_1=7$. 7

UNIT - V

9 a. Form the partial differential equation by eliminating the arbitrary constants in $z=ax^2+bxy+cy^2$. 6

b. Solve by direct integration. Given $\frac{\partial^2 z}{\partial x\partial y}=x^2y$ subject to the condition, $z(x,0)=x^2$ and $z(1,y)=\cos y$. 7

c. Find the general solution of, $x(z^2-y^2)p+y(x^2-z^2)q=z(y^2-x^2)$ 7

10 a. Find the various possible solutions of the two dimensional Laplace's equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=0$. 10

b. A tightly stretched string of length *l* with fixed ends is initially in equilibrium position. It is set to vibrating by giving each point a velocity $v_0\sin^3\frac{\pi x}{l}$. Find the displacement $y(x,t)$. 10

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