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

(An Autonomous Institution affiliated to VTU, Belgaum)

Third Semester, B.E. – Make-up Examination, July/Aug. – 2015

Engineering Mathematics - III

(Common to all Branches)

Time: 3 hrs Max. Marks: 100

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

UNIT - I

1. a. Compute $u_{14.2}$ from the following table by applying Newton's backward interpolation formula. 7

x :	10	12	14	16	18
u_x :	0.240	0.281	0.318	0.352	0.384

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

c. The following table gives the normal weights of babies during first eight months of life. 6

Age (in months):	0	2	5	8
Weight (in pounds):	6	10	12	16

Estimate the weight of the baby at the age of seven months using Lagrange's interpolation formula.

2 a. A rod is rotating in a plane. The following table gives the angle θ radians through which the rod has turned for various values of the time t. 7

t:	0	0.2	0.4	0.6	0.8	1.0	1.2
θ :	0	0.12	0.49	1.12	2.02	3.20	4.67

Calculate the angular velocity and angular acceleration of the rod when t = 0.6 second.

b. Use Simpson's $\frac{3}{8}th$ rule to evaluate $\int_1^4 e^{1/x} dx$ taking seven ordinates. 7

c. Evaluate $\int_4^{5.2} \log_e x$ taking 6 equal strips by applying Weddle's rule. 6

Contd…2

UNIT - II

3 a. Obtain the Fourier series for the function $f(x) = x^2$ *in* $-\pi \le x \le \pi$ and hence deduce that 7

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \ldots\ldots..$$

b. Obtain the Fourier series for the function $f(x) = \begin{cases} -\pi & in \quad -\pi < x < 0 \\ x & in \quad 0 < x < \pi \end{cases}$ 7

c. Obtain the Fourier series for the function $f(x) = x - x^2$ *in* $-1 < x < 1$ 6

4 a. Obtain the Fourier series for the function: 7

$$f(x) = \begin{cases} 1 + \frac{4x}{3} & in \quad -\frac{3}{2} < x \le 0 \\ 1 - \frac{4x}{3} & in \quad 0 \le x < \frac{3}{2} \end{cases}$$

b. Find the half range cosine series for $f(x) = x(l - x)$ *in* $0 \le x \le l$ 6

c. Given the following table: 7

x^o :	0	60^o	120^o	180^o	240^o	300^o
y :	7.9	7.2	3.6	0.5	0.9	6.8

Obtain the Fourier series neglecting terms higher than first harmonics.

UNIT - III

5 a. Find the complex Fourier transform of the function 7

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

Hence evaluate $\int_0^\infty \frac{\sin x}{x} dx$

b. Obtain the Fourier cosine transform of the function 7

$$f(x) = \begin{cases} 4x & , \quad 0 < x < 1 \\ 4 - x & , \quad 1 < x < 4 \\ 0 & , \quad x > 4 \end{cases}$$

c. Solve the integral equation: 6

$$\int_0^\infty f(\theta) \cos \alpha\theta d\theta = \begin{cases} 1 - \alpha & , \quad 0 \le \alpha \le 1 \\ 0 & , \quad \alpha > 1 \end{cases}$$

and hence evaluate $\int_0^\infty \frac{\sin^2 t}{t^2} dt$

6. a. Obtain the Z-transform of $Coshn\theta$ and $Sinhn\theta$. 7

Contd…3

b. Compute the inverse Z-transform of $\dfrac{3z^2+2z}{(5z-1)(5z+2)}$ 7

c. Solve by using Z-transforms: $y_{n+2}-4y_n=0$ given that $y_0 = 0$, and $y_1 = 2$. 6

UNIT - IV

7 a. Form the partial differential equation by eliminating the arbitrary function. 7

$\phi\left(x+y+z, \quad x^2+y^2-z^2\right)=0$

b. Solve by the method of separation of variables. 7

$4\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}=3u$, given that $u(0,y)=2e^{5y}$

c. Solve $x\left(y^2+z\right)p-y\left(x^2+z\right)q=z\left(x^2-y^2\right)$ 6

8 a. Obtain the various possible solution of one dimensional heat equation by the method of separations of variables. Which is the befitting solution? 10

b. Obtain D'Alembert's solution of the one dimensional wave equation. 10

UNIT - V

9 a. Test for the convergence: 7

$\sum_{n=1}^{\infty}\left[\sqrt{n^4+1}-\sqrt{n^4-1}\right]$

b. Test for the convergence of the series. 7

$1+\dfrac{2}{3}x+\dfrac{2.3}{3.5}x^2+\dfrac{2.3.4}{3.5.7}x^3+...... \quad (x>0)$

c. Find the nature of the series: 6

$\dfrac{x}{1.2}-\dfrac{x^2}{2.3}+\dfrac{x^3}{3.4}-\dfrac{x^4}{4.5}...... \quad (x>0)$

10 a. Develop the series solution of the equation $\left(1+x^2\right)y''+xy'-y=0$ 7

b. Obtain the series solution of Bessel's differential equation $x^2y''+xy'+\left(x^2-n^2\right)y=0$ 7

c. Express x^3+2x^2-4x+5 in terms of Legendre's polynomials. 6

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