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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; Jan/Feb - 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	1	2	3	4	5
$u(x)$	8	?	64	?	216

b. Find the number of students who have obtained

i) Less than 45 marks ii) Between 40 and 45 marks using the following data. 7

Marks:	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
No. of Students	31	42	51	35	31

c. Using Newton's general interpolation formula, fit an interpolating polynomial for the data : 7

x	-3	0	1	3
$f(x)$	2	1	0	-1

2 a. Use Lagrange's interpolation formula, find $f(10)$, using the following data : 6

x:	5	6	9	11
y:	12	13	14	16

b. Use Stirling's interpolation formula to find Y_{35}, given $Y_{20} = 512$, $Y_{30} = 439$, $Y_{40} = 346$ and $Y_{50} = 243$. 7

c. Find $f(2.5)$ by using Bessel's interpolation formula given that : 7

x	0	1	2	3	4
$f(x)$	7.4720	7.5854	7.6922	7.8119	7.9252

UNIT - II

3 a. Given the data : 6

x	0	2	4	6	8
$f(x)$	7	13	43	145	367

Compute $f'(7)$.

b. Find $f'(6)$ and $f''(6)$ from the following data : 7

x	0	2	3	4	7	9
$f(x)$	4	26	58	112	466	922

Using Newton's divided difference formula.

Contd......2

c. Find the maximum and minimum value of y from the following data : 7

x	0	1	2	3	4
y	0	-0.25	2	15.75	56

4 a. Use Boole's formula to evaluate $\int_1^5 e^{1/x}dx$, taking $h = 1$. 6

b. Use Simpson's $\left(\frac{3}{8}\right)^{th}$ rule, evaluate $\int_0^{0.3} \sqrt{1-8x^3}\,dx$ by considering three equal intervals. 7

c. Using Weddle's rule, evaluate taking 6 equal parts, $\int_4^{5.2} \log_e x\,dx$. 7

UNIT - III

5 a. Find the Fourier series of $f(x)$,if $f(x)=\begin{cases} x, & 0 \le x \le \pi \\ 2\pi - x, & \pi \le x \le 2\pi \end{cases}$ 6

b. Expand $f(x)=x-x^2$ in terms of Fourier series valid in $-\pi < x < \pi$. 7

c. Find the half-range cosine series of $f(x)=(x-1)^2$ valid in $0 \le x \le 1$. Hence, deduce that,

$$\frac{\pi^2}{6}=\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.....$$ 7

6 a. Obtain the complex form of the Fourier series for $f(x)=x$ in $-\pi \le x \le \pi$. 6

b. Obtain the Fourier series of $f(x)=|x|$ in $[-l,l]$. 7

c. Express y as a Fourier series upto second harmonics, given : 7

x	0	$\pi/3$	$2\pi/3$	π	$4\pi/3$	$5\pi/3$	2π
y	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98

UNIT - IV

7 a. Find the Fourier transform of, $f(x)=\begin{cases} 1, & \text{for } |x| \le 1 \\ 0, & \text{for } |x| > 1 \end{cases}$ and hence evaluate $\int_0^\infty \left(\frac{\sin x}{x}\right) dx$. 6

b. Find the Fourier sine transform of $e^{-|x|}$. Hence show that: $\int_0^\infty \frac{x \sin mx}{1+x^2}\,dx = \frac{\pi}{2} e^{-m},\ m > 0$. 7

c. Show that $f(x)=xe^{-x^2/2}$ is self-reciprocal under Fourier cosine transform. 7

8 a. Find the Z-transforms of $\cos n\theta$ and $\sin n\theta$. 6

b. Obtain the inverse Z -transforms of $\frac{z^3-20z}{(z-2)^3(z-4)}$. 7

c. Solve, $y_{n+2}-4y_n=0$ with $y_0=0$, and $y_1=2$, using Z -transforms. 7

UNIT - V

9 a. Form the partial differential equation by eliminating the arbitrary function in $f\left(x^2+y^2, z-xy\right)=0$. 6

b. Solve $\left(\partial u/\partial x\right)=2\left(\partial u/\partial t\right)+u$ with $u\left(x,0\right)=6e^{-3x}$, by using the method of separation of variables. 7

c. Solve: $x\left(y^2-z^2\right)p+y\left(z^2-x^2\right)q=z\left(x^2-y^2\right)$. 7

10 a. Obtain the various possible solutions of $\frac{\partial^2 u}{\partial t^2}=C^2\frac{\partial^2 u}{\partial x^2}$, by the method of separation of variable. 10

b. Solve the heat equation $\frac{\partial u}{\partial t}=\frac{\partial^2 u}{\partial x^2}$ with boundary conditions, $u\left(x,0\right)=3\sin n\pi x \text{ and } u\left(0,t\right)=0=u\left(1,t\right)$. 10

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