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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS) III-Semester Main Examinations, December-2017

Engineering Mathematics-III

(Common to Civil, CSE, ECE & Mech.)

Time: 3 hours Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 =20 Marks)

1. Write the Dirichlet's conditions for existence of Fourier series of a function $f(x)$ in $(\alpha, \alpha+2\pi)$.
2. Find the coefficient b_1 in the half-range Fourier sine series of $f(x)=\begin{cases} 1, & 0<x<\frac{1}{2} \\ 0, & \frac{1}{2}\le x<1 \end{cases}$
3. Solve $p-q=z^2$.
4. Find the complete integral of the partial differential equation $(px+qy-z)^2=p^2+q^2$
5. Find $\Delta(x+\cos x)$, if $h=\pi$.
6. Using Euler's method, find the approximate value of $y(0.2)$ for the initial value problem $y'=x^2+y^2, y(0)=1$.
7. Derive normal equations for fitting a straight line by the method of least squares.
8. The equations of two regression lines are $2x-3y=0$ and $4y-5x-8=0$. Find the mean values $\bar{x}$ and $\bar{y}$.
9. A fair die is tossed. Let the random variable X denote the twice the number appearing on the die. Find the probability distribution of X.
10. If $M_X(t)=\frac{2}{2-t}$ is the moment generating function of a random variable X, find the variance of X.

Part-B (5 × 10 = 50 Marks)

11. a) Obtain the Fourier series for $f(x)=\begin{cases} -\pi, & -\pi<x<0 \\ x, & 0<x<\pi \end{cases}$. Hence deduce that $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+----=\frac{\pi^2}{8}$. [7]

    b) Express $f(x)=x$ as a cosine series in $0<x<2$. [3]

12. a) Find all possible second order partial differential equations by eliminating the arbitrary constants a,b,c from $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$. [4]

    b) A tightly stretched string with fixed end points $x=0$ and $x=\pi$ is initially at rest in its equilibrium position. If it is set vibrating by giving each point a velocity $0.03\sin x-0.04\sin 3x$, find the displacement at any point of the string at any time t. [6]

13\. a) The following table gives the velocity v of a particle at time t . Find its acceleration at t=2. [5]

t:	0	2	4	6	8	10	12
v:	4	6	16	34	60	94	131

b) Using Newton's divided difference formula, find the missing value from the following table: [5]

x:	1	2	4	5	6
y:	14	15	5	-	9

14\. Find the coefficient of correlation and the equations of the two lines of regression from the following data: [10]

x	1	3	4	6	8	9	11	14
y	1	2	4	4	5	7	8	9

15\. a) If a continuous random variable X has the distribution function

$$F(x)=\begin{cases} 0, & x\le 1 \\ k(x-1)^4, & 1<x\le 3 \\ 1, & x>3 \end{cases}$$

, find the i) probability density function $f(x)$ ii) k and iii) mean. [3]

b) Two independent samples of sizes 8 and 7 respectively had the following values of the variable: [7]

Sample 1: 9 11 13 11 15 9 12 14

Sample 2: 10 12 10 14 9 8 10

Is the difference between the means of samples significant? (Given $t_{0.05}(13)=2.16$)

16\. a) Expand $f(x)=|\cos x|$ in Fourier series for $-\pi<x<\pi$. [5]

b) Find the general solution of $x(z^2-y^2)p+y(x^2-z^2)q=z(y^2-x^2)$. [5]

17\. Answer any *two* of the following:

a) Find the cubic polynomial which takes the following values using Newton's backward interpolation formula. [5]

x:	0	1	2	3
f(x):	0	2	1	10

b) If θ is the acute angle between the two regression lines, show that [5]

$$\tan\theta=\frac{1-r^2}{r}\,\frac{\sigma_x\sigma_y}{\sigma_x^2+\sigma_y^2}.$$

c) If X is a normal variate with mean 30 and standard deviation 5, find the probabilities that i) $26\le X\le 40$ and ii) $X\ge 45$. [5]

(Given $P(0<z<2)=0.4772$, $P(0<z<0.8)=0.2881$, $P(0<z<3)=0.4987$)

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