MANAV RACHNA vidyanatariksha

MANAV RACHNA UNIVERSITY
(FORMERLY MANAV RACHNA COLLEGE OF ENGINEERING
NAAC ACCREDITED 'A' GRADE INSTITUTION)
Declared as State Private University under section 2f of the UGC act, 1956

DEPARTMENT OF MATHEMATICS

"T3Examination, May2017-18"

Semester:Second
Subject:Engg. Mathematics-II
Branch: ME
Course Type: Core
Time: 3 Hours
Max.Marks: 80

Date of Exam:21/05/2018
Subject Code:MAH105-T
Session: I
Course Nature: Hard
Program: B.Tech
Signature: HOD/Associate HOD:

Note: All questions are compulsory from part A (2*10 = 20 Marks). Attempt any two questions from Part B (15 Marks each). Attempt any two Questions from Part -C (15 Marks each).

PART -A

Q.1 (a) If $F(x) = x^2$ is an even function in (-π, π), then find the values of a_0, a_n & b_n.

(b) The expansion of $f(x) = |\cos x|$ as a Fourier series in (-π, π) does not contains……terms.

(c) If f(x) is an odd function in (-l, l), then the Fourier Co-efficient a_n =…….

(d) Find the Fourier sine transform of $\frac{1}{x}$.

(e) Write the Fourier transform of dirac-delta function.

(f) Is the matrix $\begin{matrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{matrix}$ orthogonal?

(g) The characteristic equation of $\begin{matrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{matrix}$ is……

(h) Define Rank of matrix with suitable example.

(i) The product of the eigen values of $\begin{matrix} 2 & 3 & -2 \\ -2 & 1 & 1 \\ 1 & 0 & 2 \end{matrix}$ is……..

(j) The rank of identity matrix of order 3 × 3 is……..

PART - B

Q.2 (a) Obtain the Fourier series to represent $F(x) = \left(\frac{\pi - x}{2}\right)^2$, $0 \le x \le 2\pi$.-

Hence obtain the following relations: (12)

****

(i) $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\cdots\ldots\ldots\ldots\ldots=\sum_{n=1}^{\infty}\frac{1}{n^2}=\frac{\pi^2}{6}$

(ii) $\frac{1}{1^2}-\frac{1}{2^2}+\frac{1}{3^2}-\frac{1}{4^2}+\cdots\ldots\ldots\ldots\ldots=\sum_{n=1}^{\infty}\frac{(-1)^{n-1}}{n^2}=\frac{\pi^2}{12}$

(iii) $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots\ldots\ldots\ldots\ldots=\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}=\frac{\pi^2}{8}$

(b) Obtain the half range sine series for e^x in $0 < x < 1$. (7)

Q.3 (a) Obtain a half range cosine series for $f(x)=\begin{cases}kx\ for\ 0\le x\le\frac{l}{2}\\ k(l-x) for\ \frac{l}{2}\le x\le l.\end{cases}$ (10)

Deduce the sum of the series $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\cdots\ldots\ldots\ldots\ldots$

(b) Express the function $f(x)=\begin{cases}1, for\ |x|\le 1\\ 0, for\ |x|\ge 1\end{cases}$ (5)

As a Fourier Integral. Hence evaluate $\int_0^{\infty}\frac{\sin\lambda Cos\,\lambda x}{\lambda}d\lambda$.

Q.4 (a) Find Fourier sine transform of $\frac{1}{x(x^2+a^2)}$. (10)

(b) Find the Fourier transform of for $f(x)=\begin{cases}1-x^2, if|x|<1\\ 0\ , \quad if\ |x|>1.\end{cases}$ (5)

PART -C

Q.5 (a) Find rank of the matrix $\begin{matrix}3 & -1 & 2\\ -6 & 2 & 4\\ -3 & 1 & 2\end{matrix}$ by reducing it in its normal form. (10)

(b) Investigate the values of λ and μ so that the equations $2x+3y+5z=9$, $7x+3y-2z=8$, $2x+3y+\lambda z=\mu$have- (i) no solution (ii) a unique solution and (iii) an infinite number of solution. (5)

Q.6 (a) Verify that the matrix $\begin{matrix}\cos\theta & 0 & \sin\theta\\ 0 & 1 & 0\\ -\sin\theta & 0 & \cos\theta\end{matrix}$ is orthogonal (5)

(b) Using Cayley-Hamilton Theorem, find the inverse of the matrix $\begin{matrix}1 & 2 & 4\\ -1 & 0 & 3\\ 3 & 1 & -2\end{matrix}$ (10)

Q.7(a) Diagonalise the matrix $\begin{matrix}-1 & 2 & -2\\ 1 & 2 & 1\\ -1 & -1 & 0\end{matrix}$ and obtain the model matrix. (5)

(b)Find eigen values and the corresponding eigen vectors of the matrix $\begin{matrix}6 & -2 & 2\\ -2 & 3 & -1\\ 2 & -1 & 3\end{matrix}$ (10)

****