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I/IV B.Tech. (Supple). DEGREE EXAMINATIONS, APRIL/MAY- 2016

First Semester

BT/CSE/ECE/EEE

MATHEMATICS-I

Time: Three Hours **Maximum marks:60**

Answer Question No.1 Compulsory **12X1=12 M**

Answer ONE question from each Unit **4X12=48 M**

1. a. State Cayley-Hamilton theorem

   b. Find the nature of the quadratic form $x^2+4y^2+z^2-4xy+2xz-4yz$

   c. Find the eigne values of $\begin{bmatrix} 4 & 1-3i \\ 1+3i & 7 \end{bmatrix}$

   d. State Rolle's Theorem

   e. Write Taylor's series

   f. State the relation between cartesian coordinates to spherical polar co-ordinates.

   g. Find $\int_0^2\int_0^x ydxdy$

   h. State Dirichlet's conditions for Fourier series

   i. Write the vlaue of $\int_0^{\text{®}/2} \sin^p x\cos^q xdx,\ p>-1, q>-1$

   j. State complex form of Fourier series

   k. State Parseval's formulae.

   l. Define Half range cosine series.

UNIT-I

2. a. Find the Rank of the matrix $A=\begin{bmatrix} 1 & 4 & 3 & -2 & 1 \\ -2 & -3 & -1 & 4 & 3 \\ -1 & 6 & 7 & 2 & 9 \\ -3 & 3 & 6 & 6 & 12 \end{bmatrix}$

   b. Find the eigen values and eigen vectors of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$

P.T.O

(OR)

3. a. Reduce the quadratic form $8x^2+7y^2+3z^2-12xy-8yz+4zx$ to “sum of squares” by an orthogonal transformation and give the matrix transformation.

b. Shwo that $(I-A)(I+A)^{-1}$ is a unitary matrix where $A=\begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$

UNIT-II

4. a. Verify Lagrange’s Mean value theorem for $f(x)=x^3-3x-1$ in $\left(\frac{-11}{7},\frac{13}{7}\right)$ and find approximate value of c.

b. Find the maximum and minimum values of $2(x^2-y^2)-x^4+y^4$

(OR)

5. a. Fit a second degree curve $y=a+bx+cx^2$ for the following data using principle of Least squares:

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

b. Use Taylor’s series, to prove that

$$\mathrm{Tan}^{-1}(x+h)=\mathrm{Tan}^{-1}x+(h\sin z).\frac{\sin z}{1}-(h\sin z)^2.\frac{\sin 2z}{2}+(h\sin z)^3.\frac{\sin 3z}{3}-........$$

Where $z=\cot^{-1}x$

UNIT-III

6. a. Evlauate $\int_0^a\int_{x^2/a}^{2a-x} xydydx$ by changing the order of integration.

b. Find the volume bounded by the cylinder $x^2+y^2=4$ and the hyperboloicl $x^2+y^2-z^2=1$

(OR)

7. a. Evaluate $\iint \frac{rdrd¯}{\sqrt{a^2+r^2}}$ over one loop of the leminiscate $r^2=a^2\cos 2¯$

b. Prove that $\int_0^\infty \frac{e^{-x^2}}{\sqrt{x}}dx\times\int_0^\infty x^2e^{-x^4}dx=\frac{®}{4\sqrt{2}}$

P.T.O

UNIT-IV

8. a. Find a Fourier series to represent $x - x^2$ from $x = -®$ to $x = ®$. Hence show that

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

b. Obtain the Fourier series for the function $f(x) = \begin{cases} ® x & , 0 \le x \le 1 \\ ® (2 - x) & , 1 \le x \le 2 \end{cases}$

(OR)

9. a. Find the complex form of Fourier series for e^x in $-® < x < ®$

b. Find the Fourier series of x^2 in $(-®, ®)$. Use parseval's identity to prove that

$$\frac{®^4}{90} = 1 + \frac{1}{2^4} + \frac{1}{3^4} + ...$$

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I/IV B. Tech. DEGREE EXAMINATIONS, DECEMBER - 2016

First Semester

BT / CSE / ECE / EEE

MATHEMATICS - I

Time : **Three Hours** Maximum Marks : **60**

Answer Question No. 1 Compulsory. 12x1=12 M

Answer ONE question from each Unit. 4x12=48 M

1. a) Define rank of a matrix.

   b) Write any two properties of eigen vectors.

   c) Define unitary matrix.

   d) State Cauchy's mean value theorem.

   e) What do you mean by curve fitting ?

   f) Define beta function.

   g) Define error function.

   h) Define model matrix.

   i) Write Euler's formulae for Fourier series.

   j) Define even function.

   k) Write Taylor's theorem.

   l) Write Parseval's identity for Fourier series.

UNIT - I

2. a) Investigate for what values of λ and μ the simultaneous equations $x+y+z=6$, $x+2y+3z=10$, $x+2y+\lambda z=\mu$ have (i) no solution (ii) a unique solution (iii) an infinite number of solutions.

   b) Find the characteristic equations of the matrix $A = \begin{bmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{bmatrix}$ and hence find A^{-1}.

(OR)

3. Reduce the quadratic form $2xy+2yz+2zx$ into canonical form. Also specify the matrix of transformation. Discuss the nature of the quadratic form.

UNIT - II

4. a) State Rolle's theorem and verify it for $f(x) = x(x+3)e^{-\frac{1}{2x}}$ in (-3, 0).

   b) Discuss the maxima and minima of $f(x) = x^3 y^2 (1 - x - y)$.

(OR)

5. a) Expand $x^2y + 3y - z$ in powers of $(x-1)$ and $(y+2)$ using Taylor's theorem.

   b) By the method of least squares fit a curve $y = ax^b$ to the following data :

x	:	1	2	3	4	5
y	:	0.5	2	4.5	8	12.5

UNIT - III

6. a) Evaluate $\iint \frac{r}{\sqrt{a^2+r^2}}\, dr\, d$¯ over one loop of the lemniscate $r^2 = a^2 \cos 2\theta$.

   b) Evaluate $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y}\, dy\, dx$ by changing the order of integration.

(OR)

7. a) Evaluate $\int_0^\infty e^{-ax} x^{m-1} \sin bx\, dx$ interms of Gamma function.

   b) Evaluate $\int_0^a \int_y^a \frac{x^2}{\sqrt{x^2+y^2}}\, dx\, dy$ by changing to polar co-ordinates.

UNIT - IV

8. a) Find the Fourier series for $f(x) = e^{-x}$ in $0 < x < 2\pi$.

   b) Find the half range cosine series of the function $f(x) = \pi - x$, $0 < x < \pi$.

(OR)

9. a) Find the complex form of Fourier series for the function $f(x) = \cos ax$, $-\pi < x < \pi$.

   b) If $f(x) = |\cos x|$, expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$.