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CODE NO:- U-001

FACULTY OF ENGINEERING

First Engg Examination

DECEMBER 2014

Engineering Mathematics - II

(Revised)

[Time: THREE *Hours*] **[Max. Marks: 80]**

"Please check whether you have got the right question paper."

N.B
1) *Question number one and six are compulsory.*
2) *Attempt any 2 questions from remaining 4 questions from each section*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data if necessary.*

SECTION A

Q.1 Attempt any five of the following 10

a) Evaluate $\int_0^\infty e^{-x}x^{2n+1}\,dx$

b) Evaluate the value of β $(\frac{1}{2},\frac{3}{2})$.

c) Evaluate $\int_0^\pi$ $\sin^6 x \cos^4 x\,dx$

d) Find the mean value of y=x from x=0 to 3

e) The surface area of solid formed the revolution of the curve y = f(x) about x-axis from x=a to x=b

f) Change the order of integration $\int_0^1 \int_0^{\sqrt{1-x^2}} f(x,y)dxdy$.

g) Evaluate $\int_0^\pi \int_0^{a(1+\cos\theta)} dr\,d\theta$

h) Evaluate $\int_0^a \int_0^a \int_0^a dx\,dy\,dz$

Q.2 a) Evaluate $\int_0^\pi x \sin^5 x \cos^4 x\,dx$ 5

b) Evaluate $\int_0^1 \int_x^{\sqrt{x}} (x^2+y^2)\,dx\,dy$ 5

c) Find the volume bounded by the cylinder $x^2+y^2 = 4$ & y + z = 3 & z = 0 5

Q.3 a) Evaluate $\int_0^\infty \sqrt{t}\,e^{-\sqrt{t}}dt$ 5

b) Change the order of integration $\int_0^1 \int_{x^2}^{2-x} f(x,y)\,dx\,dy$ 5

c) Find by the double integration the area included between the curves $y=x^2$ & y= 2x+3. 5

Q.4 a) Evaluate $\int_0^1 x^5 (1-x^3)^{10}\,dx$ 5

b) Change the polar coordinate. Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} e^{-x^2-y^2}dxdy$ 5

c) Find the surface of the solid formed by the revolution of the cardiode r= a(1+cos θ) 5

Q.5 a) Prove that $\beta(m,n) = \int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}\,dx$ 5

b) Evaluate $\int_0^1 \int_{y^2}^1 \int_0^{1-x} x\,dx\,dy\,dz$. 5

c) Find the RMS value of F= 2.75 sin 80 πt over a period of t= 0 to t=1/80 5

SECTION B

Q.6 Attempt any 5 of the following 10

a) Define periodic function with example.

b) If $f(x) = \pi^2 - x^2$ over $(-\pi, \pi)$ then write the value of Fourier coefficients a_0.

c) What is the half range cosine series for f(x) in the interval (0, L) & write its Fourier Coefficients.

d) It $f(x) = x$; $x \in (o, 2\pi)$ with period 2π find Fourier coefficients a_n

e) Find the rank of AB if $A=\begin{bmatrix}-1 & 2\\ 3 & 2\end{bmatrix}$ $B=\begin{bmatrix}-1 & 1\\ 2 & 0\end{bmatrix}$

f) State the condition for consistency of system of linear homogeneous equation.

g) Find the characteristic equation & Eigen value of $A=\begin{bmatrix}9 & -7\\ 3 & -3\end{bmatrix}$

h) State Cayley – Hamilton Theorem

Q.7 a) Find the Fourier series expansion for $f(x) = \frac{\pi - x}{2}$ in the interval $0<x<2\pi$ with period 2π 5

b) Find the rank of the matrix $A=\begin{bmatrix}1 & 0 & -5 & 6\\ 3 & -2 & 1 & 2\\ 5 & -2 & -9 & 14\\ 4 & -2 & -4 & 8\end{bmatrix}$ 5

c) Check the consistency and solve if possible 5

2x-y+3z=8
-x+2y+z=4
3x+y-4z=0

Q.8 a) Find the Eigen value & Eigen vector for the smallest Eigen value of matrix $a=\begin{bmatrix}1 & 1 & 1\\ 0 & 2 & 1\\ -4 & 4 & 3\end{bmatrix}$ 5

b) Find the half range cosine series for $f(x) = x^2$ in the interval $(0,\pi)$ 5

c) Express $f(x)= \frac{x\pi^2}{2}$ as Fourier series defined in $-\pi<x<\pi$ 5

Q.9 a) Obtain the characteristic equation of the matrix $A=\begin{bmatrix}1 & 2 & 3\\ 0 & 2 & 3\\ 0 & 0 & 2\end{bmatrix}$ and then find A^{-1} 5

b) Find the Fourier series for $f(x) = \begin{cases}\pi x & ; 0<x<1\\ 0 & ; 1<x<2\end{cases}$ 5

c) Check the consistency and solve 5

x+3y-2z=0
2x-y+4z =0
x-11y+14 z = 0

Q.10 a) Find the Fourier series for $f(x) = x-x^3$ in (-1, 1) 5

b) Find the half range cosine series for $f(x) = e^x$ in the interval $(0, \pi)$ 5

c) Show that the transformation of 5

$x_1 = 2y_1-2y_2-y_3$
$x_2=-4y_1+5y_2+3y_3$
$x_3=y_1-y_2-y_3$