Total No. of Printed Pages:3

SUBJECT CODE NO:- P-262
FACULTY OF ENGINEERING AND TECHNOLOGY
F.E. Examination MAY/JUNE-2016
Engineering Mathematics-II
(Revised)

[Time:Three Hours] **[Max Marks:80]**

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

N.B
i) Q.No.1 and Q.No.6 are compulsory.
ii) Attempt any two questions from remaining questions from each section.
iii) Figures to the right indicate full marks.
iv) Assume suitable data, if necessary.

Section A

Q.1 Solve any five questions from the following:- 10

a) Evaluate $\int_0^{\pi} cos^3\left(\frac{t}{2}\right) sin^4 t\ dt$

b) Evaluate $\int_0^2 x^3 \sqrt{2-x}\ dx$

c) Find the mean value of the ordinates of a semicircle of radius 'a'.

d) Evaluate $\int_0^1 \int_0^x e^{\frac{y}{x}}\ dydx$

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

f) Evaluate $\int_1^2 \int_0^{\log r} r\ d\theta dr$

g) Find the volume of the solid generated by the curve $y = \sin x$ between the $x = 0$ and $x = \pi$.

h) The surface area of the solid generated by the revolution of the area bounded by the curve $x = f(y)$, the y-axis and the abscissae $y = c$ and $y = d$ about the y-axis is _____.

Q.2 a) Evaluate $\int_0^{\infty} a^{-4x^2}\ dx$ 05

b) Evaluate $\int_0^1 \int_0^y xye^{-x^2}\ dxdy$ 05

c) Find the surface area of the solid generated by revolving the asteroid $x^{\frac{2}{3}} + y^{\frac{2}{3}} = a^{\frac{2}{3}}$ about the X-axis. 05

Q.3 a) Evaluate $\int_0^2 x(8-x^3)^{\frac{1}{3}}\ dx$ 05

b) Evaluate $\iint_R e^{y^2} dxdy$, over the triangle whose vertices are (0,0), (2,1), (0,1). 05

c) Find the area of the larger region bounded by the circle $x^2 + y^2 = 9$ and the straight line $x = 3 - y$. 05

Q.4 a) Evaluate $\int_0^{\infty} \frac{\sqrt{x}}{25+10x+x^2} dx$ 05

b) Change the order of integration and evaluate $\int_0^1 \int_x^{2-x} \frac{x}{y}\ dydx$ 05

c) Find the volume of the cylinder $y^2 = x$ and $x^2 = y$ and $z = 0$, $x + y + z = 2$ 05

Q.5 a) Evaluate $\int_0^4 \int_0^{2\sqrt{z}} \int_0^{\sqrt{4z-x^2}} dydxdz$ 05

b) Change the polar co-ordinate and evaluate $\iint \frac{dxdy}{4-x^2-y^2}$ over the region bounded by the concentric circle $x^2 + y^2 = 1$ and $x^2 + y^2 = 3$. 05

c) Find the RMS value of $\log x$ over the range $x = 1$ and $x = e$. 05

Section B

Q.6 Solve any five from the following: 10

a) If $f(x) = \frac{x(\pi^2-x^2)}{12}$ in the interval$(-\pi, \pi)$, then find the Fourier coefficients.

b) If $f(x) = x \sin x$ in the interval$(0,2\pi)$, then find a_0.

c) If $(x) = 1 - x^2$, in the interval (-1,1), then find a_n.

d) Define the Fourier series expansion and Fourier coefficients of $f(x)$ with period 2L in the interval (C, C+2L).

e) Verify Cayley-Hamilton theorem for A=$\begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix}$

f) Find the rank of the matrix A=$\begin{bmatrix} 4 & -1 \\ -2 & 3 \end{bmatrix}$

g) If the characteristic equation for the matrix A is $\lambda^3 - 18\lambda^2 + 45\lambda = 0$, then find Eigen values of the matrix A.

h) Examine whether the following vectors are linearly independent or dependent.
$X_1 = (1, 2, 3)$, $X_2 = (2, 4, 6)$

Q.7 a) Obtain the Fourier series to represent e^x in the interval $0 < x < 2\pi$. 05

b) Find Half-range sine series for $x(\pi - x)$ in the interval $0 \le x \le \pi$. 05

c) Find the rank of the matrix 05

$$A = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 4 & 1 & 2 & 1 \\ 3 & -1 & 1 & 2 \\ 1 & 2 & 0 & 2 \end{bmatrix}$$

Q.8 a) Find the Fourier series for 05

$f(x) = 2$, $-2 < x < 0$

$= x$, $0 < x < 2$

b) Find the Fourier series of $f(x) = \cos hax$ in the interval$(-\pi, \pi)$. 05

c) Investigate the value of λ and μ, so that the system $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$ has 05

i. Unique solution

ii. No solution

Q.9 a) Solve the following equations 05

$7x + y - 2z = 0$, $x + 5y - 4z = 0$, $3x - 2y + z = 0$, $2x - 7y + 5z = 0$.

b) Find the Fourier series of $f(x) = x + 1$, $-1 < x < 0$ 05

$= x - 1$, $0 < x < 1$

c) Find the Eigen values and Eigen vector for the highest Eigen value of the matrix. 05

$$A = \begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$$

Q.10 a) Find the Half-range cosine series for the function $f(x) = \cos \lambda x$, $0 < x < \pi$ (If λ is not an integer). 05

b) Verify Cayley-Hamilton theorem for the matrix 05

$$A = \begin{bmatrix} 1 & 1 & -2 \\ -1 & 2 & 1 \\ 0 & 1 & -1 \end{bmatrix}$$ And use it to find A^{-1}.

c) Examine whether the following vectors are linearly independent or dependent. 05

X_1 =[3,1,4] , X_2=[2,2,-3] , X_3=[0,-4,1]