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FACULTY OF ENGINEERING AND TECHNOLOGY

F.E(All) Examination Nov/Dec 2015

Engineering Mathematics-II

(Revised)

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

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

N.B i) Question number one and six are compulsory.
ii) Attempt any two questions from the remaining questions in each section.
iii) Figures to the right indicate full marks.
iv) Assume suitable data, if necessary.

Section – A

Q1. Solve any five from the following. 10

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

b) Evaluate $\int_0^1 \sqrt{1 - x^{\frac{1}{2}}dx}.$

c) Find the RMS value of F(x) = e^x + 1 over the range x= 0 to x = 2.

d) Evaluate $\int_{10}^1 \int_0^{\frac{1}{y}} y\ e^{xy}\ dx\ dy.$

e) Change the order of integration $\int_0^1 \int_1^{e^x} f(x, y) dy\ dx$

f) Evaluate $\int_1^2 \int_0^{logr} d\theta\ dr.$

g) Find the volume of solid of revolution generated by revolving the curve whose parametric equation are x = 2t + 3, y = 4t^2 – g, about x-axis, between t = $\frac{-3}{2}$ to t = $\frac{3}{2}$.

h) The surface area of the solid generated by the revolution of the area bounded by the curve y = f(x), the x-axis and the ordinate x = a and x = b, about the x-axis is ----------

Q.2. a) Evaluate $\int_0^\infty \frac{1}{3^{4x^2}} dx$ 05

b) Evaluate $\int_0^\infty \int_0^\infty e^{-x^2(1+y^2)} x\ dx\ dy$ 05

c) Find the area of the surface of revolution generated by revolving the curve x = y^3 from y = 0 to y = 2 about y-axis. 05

Q.3 a) Evaluate $\int_0^1 \frac{1}{\sqrt[3]{1-x^3}}\ dx$ 05

b) Evaluate $\iint_R (5 - 2x - y) dx\ dy$, where R is y = 0, x + 2y = 3 and x = y^2. 05

c) Find the area bounded by y = x^2 – 3x and the line y = 2x. 05

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

b) Change the order of integration and evaluate $\int_0^{a} \int_y^{\sqrt{ay}} \frac{x}{x^2+y^2} dxdy.$ 05

c) Find the volume bounded by the cylinders $x^2 + y^2 = 2ax \text{ and } z^2 = 2ax.$ 05

Q.5 a) Evaluate $\int_1^3 \int_{\frac{1}{x}}^{1} \int_0^{\sqrt{xy}} xyz\ dx\ dy\ dz.$ 05

b) Change to polar co-ordinate and evaluate $\int_0^1 \int_{x^2}^{x} \frac{dx\ dy}{\sqrt{x^2+y^2}}.$ 05

c) Find the mean value of $e^{-x^2-y^2}$ over $x^2 + y^2 = 1$. 05

Section – B

Q.6 Solve any five from the following : 10

a) Find the value of Fourier coefficient bn, if $f(x) = 2x - x^2$ in the internal (0,3).

b) If f(x) = | x | in the interval $(-\pi, \pi)$ then find a_n.

c) If f(x) = $\sqrt{1 - \cos x}$, in the interval $0 \le x \le 2\pi$, then find a_o.

d) Define the Fourier series and Fourier coefficients of f(x) with period 2π in the interval (c, c + 2π).

e) Verify cayley – Hamilton for $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

f) If the characteristic equation for the matrix A is $\lambda^3 - 18\lambda^2 + 104\lambda - 192 = 0$, then find Eigen values of the matrix A.

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

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

$X_1 = (1, 2, 3)$ $X_2 = (2, -2, 6)$.

Q.7 a) Obtain the Fourier series for the function f (x) = 0, $-\pi \le x \le 0$ 05

= sinx , $0 \le x \le \pi$.

b) Find Half –range sine series for f(x) = a $(1-\frac{x}{l})$ for $0 \le x \le l$. 05

c) Find the rank of the matrix A= $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$ 05

Q.8) a) Find the Fourier series for 05

$f(x) = \pi x, \quad 0 \le x \le 1$

$= \pi(2-x), \quad 1 \le x \le 2$

b) Find the Fourier series for 05

$f(x) = \cos x, \ -\pi < x < 0$

$= -\cos x, \ 0 < x < \pi$

c) Test for consistency and solve the system :

$5x + 3y + 7z = 4, \quad 3x + 26y + 2z = 9, \quad 7x + 2y + 10z = 5.$ 05

Q.9 a) Find the Fourier series of $f(x) = e^{x}, \ -1 \le x \le 0$ 05

$= e^{-x}, \ 0 \le x \le 1.$

c) Determine the Eigen values and Eigen vector for the highest Eigen value of the matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$ 05

d) Determine the value of λ so that the. Equation $2x + y + 2z = 0$, $x + y + 3z = 0$, $4x + 3y + \lambda z = 0$ have non – zero solution. 05

Q.10 a) Obtain a Half – range cosine series for $f(x) = 2x - 1$, for $o < x < 1$. 05

b) Verify clayey – Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 2 & 1 & -1 \end{bmatrix}$ and use is to find A^{-1} 05

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

$X_1 = [1, 2, 3]^T, \quad X_2 = [3, -2, 1]^T, X_3 = [1, -6, -5]^T$