

SUBJECT CODE NO:- P-208
FACULTY OF ENGINEERING AND TECHNOLOGY
F. E. (All) Examination May/June 2017
Engineering Mathematics-II
[OLD]

[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 the remaining 4 questions in each section
 - iii) figures to the right indicate full marks
 - iv) Assume suitable data if necessary.

Section A

- Q.1 Attempt any five of the following 10
- 1) Evaluate : $\int_0^\pi \sin^6 \theta \cos^4 \theta d\theta$
 - 2) Define Gamma function
 - 3) The surface area of the solid formed the revolution of the curve $X=g(y)$ about y-axis from $y=c$ & $y=d$
 - 4) The mean value of the function $y=x$ from $x=0$ to $x=1$
 - 5) Change to polar co-ordinate
- $$\int_0^a \int_0^{\sqrt{a^2-x^2}} f(x,y) dx dy$$
- 6) Evaluate : $\int_0^1 \int_0^{1-x} y dx dy$
 - 7) Evaluate : $\int_0^1 t^{3/2} (1-t)^{-1/2} dt$
 - 8) Evaluate : $\int_0^3 \int_0^1 \int_0^2 dx \cdot dy \cdot dz$
- Q.2 05
- a) Evaluate : $\int_0^1 \frac{x^7}{\sqrt{1-x^4}} dx$
 - b) Evaluate : $\int_0^b \int_0^{\sqrt{x^2+b^2}} \frac{x}{x^2+y^2+b^2} dx dy$ 05
 - c) Find the volume bounded by the cylinder $x^2 + y^2 = 4$ and the plane $y+z=4$ and $z=0$ 05
- Q.3 05
- a) Evaluate : $\int_0^\infty y^z e^{-h^2 y^2} dy$ 05
 - b) Change the order of integration by showing the region of integration
 - c) Find the area bounded by the parabola $y^2 = 4x$ & line $2x - y - 4 = 0$ 05
- $$\int_0^1 \int_{x^2}^{\sqrt{2-x^2}} f(x,y) dx dy$$
- Q.4 05
- a) Show that : $\int_0^\infty \frac{x^{\frac{n}{2}-1}}{(1+x)^n} dx = \frac{1}{2} \beta\left(\frac{n}{2}, \frac{n}{2}\right)$ 05
 - b) Change to polar co- ordinate and evaluate $\iint y^2 dx dy$ 05
 Over the area which lies outside the circle $x^2 + y^2 - ax = 0$ but inside the circle $x^2 + y^2 - 2ax = 0$
 - c) Find the volume of the solid formed by revolution of the loop of the curve 05
 $x = t^2, y = t - \frac{t^3}{3}$ about x-axis

- Q.5 a) Prove that : $\beta(m, n) = \int_0^\infty \frac{t^{m-1}}{(1+t)^{m+n}} dt$ 05
 b) Evaluate : $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} xyz dx dy dz$ 05
 c) Find RMS value of the expression (a sinpt + b cospt) in the range (0, 2π) 05

Section B

Q.6 Attempt any five of the following 10

- a) Define Fourier series for function f(x) in the interval (c, c+2L)
 b) If f(x) = πx ; x ∈ (0,2), then find Fourier coefficient a₀
 c) Define half range Fourier sine series of f(x) in (o, L)
 d) Check whether following function even or odd

$$f(x) = -x; -\pi < x < o$$

$$= x; o < x < \pi$$

e) Find the rank of matrix A

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 8 & 12 \\ -1 & 7 & 3 \end{bmatrix}$$

f) The system of equation

$$2x + 3y = 0$$

$$ax + y = 0 ; \text{ has nontrivial solution if and only if } a = \text{----}$$

g) Check the following vectors are linearly dependent or independent

$$x_1 = (1, 0, 0), x_2 = (0, 0, 0), x_3 = (3, 2, 1)$$

h) Find the characteristics root of the matrix A

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

Q.7 a) Find the Fourier series to represent f(x) = π-x for x ∈ (0, 2π) 05

b) Find the rank of matrix 05

$$\begin{bmatrix} 3 & -2 & 0 & -1 \\ 0 & 2 & 2 & 7 \\ 1 & -2 & -3 & 2 \\ 0 & 1 & 2 & 1 \end{bmatrix}$$

c) Discuss the consistency of the system of equation & solve if possible 05

$$4x - 2y + 6z = 8$$

$$x + y - 3z = -1$$

$$15x - 3y + 9z = 21$$

Q.8 a) Find the half-range cosine series for the function 05

$$f(x) = 2x - 1; 0 < x < 1$$

b) Find eigen value and eigen vector corresponding to the highest eigen value of the matrix A 05

$$A = \begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$$

c) Find the Fourier series of sin h(ax) over (-π, π) 05

Q.9 a) Using Cayley – Hamilton theorem, find the inverse of a matrix A 05

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

- b) Find the Fourier series of
 $f(x) = x; \quad 0 < x < \pi$
 $= 2\pi - x; \quad \pi < x < 2\pi$
- c) Solve the equation

$$\begin{aligned} x + 3y + 2z &= 0 \\ 2x - y + 3z &= 0 \\ 3x - 5y + 4z &= 0 \\ x + 17y + 4z &= 0 \end{aligned}$$

Q.10

- a) Find Fourier series if
 $f(x) = x; \quad -1 < x < 0$
 $= x + 2; \quad 0 < x < 1$
- b) Find Fourier sine series of
 $f(x) = x; \quad 0 < x < 4$
 $= 8 - x; \quad 4 < x < 8$
- c) Find the inverse transformation of

$$\begin{aligned} y_1 &= 2x_1 + x_2 + x_3 \\ y_2 &= x_1 + x_2 + 2x_3 \\ y_3 &= x_1 - 2x_3 \end{aligned}$$