B.Sc SEMESTER –IV EXAMINATION

MATHEMATICS PAPER –II

M6:Mathematical Methods

Unit-I

Q1.The relation $P_n(x) = \frac{1}{n!2^n}\frac{d^n}{dx^n}(x^2-1)^n$ is known

a) Leibnitz thm. b)generating function for the Legendre's polynomial

c) Rodrigue's formula d)none

Ans . C

Q2. Which of the following is Bessel's function of Ist kind of order n .?

a) $J_n(x) = \sum_{r=0}^{\infty}(-1)^r \frac{1}{r!\,\Gamma(n+r+1)}(x/2)^{n+2r}$

b) $J_n(x) = \sum_{r=0}^{\infty}(-1)^r \frac{1}{r!\,\Gamma(n-r-1)}(x/2)^{n-2r}$

c) $J_n(x) = \sum_{r=1}^{\infty}(-1)^r \frac{1}{r!\,\Gamma(n-r-1)}(x/2)^{n+2r}$

d)none

Ans. a

Q3. The quantity exp $\left\{\frac{x}{2}\left(h-\frac{1}{n}\right)\right\}$ is called the-------------

a) recurrence formula b)generating function of $J_n(x)$

c) Bessels function of IInd kind d)general solution

Ans b

Q4. General solution of Bessel's differential equation is ,

a) $y = c_1 J_n(x) + c_2 J_n(x)$ b) $y = c_1 J_n(x) + c_2 J_{-n}(x)$

c) $y = c_1 J_{-n}(x) + c_2 J_{-n}(x)$ d) $y = c_1 J_{-n}(x) - c_2 J_{-n}(x)$

Ans b

Q5.Legendre's function of the IInd kind is denoted by;

a) $P_n(x)$ b) $R_n(x)$ c) $Q_n(x)$ d) $S_n(x)$

Ans c

Q6. A sequence of the function $f_n(x)$ is said to be orthogonal on the interval [a,b] if

a) $\int_a^b f_m(x) f_n(x)\, dx = \begin{cases} = 0 & fo \;\; m \neq n \\ \neq 0 & for\; m = n \end{cases}$

b) $\int_a^b f_m(x) f_n(x)\, dx = \begin{cases} = 0 & fo \;\; m \neq n \\ \neq 0 & for\; m = -n \end{cases}$

c) $\int_a^b f_m(x) f_n(x)\, dx = \begin{cases} = 0 & fo \;\; m = -n \\ \neq 0 & for\; m = n \end{cases}$

d)all of the above

Ans a

Q7.Find the Beltrami's formula ?

a) $(2n+1)(x^2-1)P_n' = n(n+1)(P_{n+1} - P_{n-1})$

b) $(2n+1)(x^2+1)P_n' = n(n+1)$

c) $(2n-1)(x^2-1)P_n' = n(n-1)$

d) none

Ans a

Q8. $(n+1)P_n$ = ---------- $- xP_n'$

a) $(n+1)P_n'$ b) P_{n-1}' c) $(n-1)P_n'$ d) P_{n+1}'

Ans d

Q9. The quantity is $(1- 2xh +h^2)^{-1/2}$

a) Legendres function of the Ist kind b) Legendres function of the IInd kind

c)generating function for Legendre's polynomial

d) recurrence formula for Legendre's polynomial

Ans c

Q10. Choose the correct,

i) $J_{-n}(x) = (-1)^n J_n(x)$, if n is +ve integer

ii) $J_n(-x) = (-1)^n J_n(x)$, if n is any integer

a) only i) true b) only ii) true c) both true d) both false

Ans c

Q11. Complete the christoffel's summation formula

$$\sum_{k=0}^{m}(2k+1)\ P_K(x)P_K(y) = \frac{m+1}{x-y}\ (-\,-\,-\,-\,-\,-\,-\,-\,-\,-\,-)$$

a) $P_{m+1}(x)P_m(y) - P_m(x)P_{m+1}(y)$ b) $P_m(y) - P_m(x)$

c) $P_m(y) + P_m(x)$ d) $P_{m+1}(x) - P_{m+1}(y)$

Ans a

Q12. $J_n(x) = \frac{1}{\pi}\int_0^{\pi}\cos(n\theta - x\sin\theta)d\theta$ is called as

a) orthogonal b)Bessel's integral

c)Jacobi series d) none

Ans b

Q13.which is the following modified Bessel's equation?

a) $x^2y'' + xy' - (\lambda^2x^2 + n^2)y = 0$ b) $x^2y'' - xy' + (\lambda^2x^2 - n^2)y = 0$

c) $x^2y'' - xy' - (\lambda^2x^2 + n^2)y = 0$ d) $x^2y'' + xy' + (\lambda^2x^2 - n^2)y = 0$

Ans d

Q14. Pick out the correct recurrence formulae

$i) J'_n(x) = \frac{1}{2}[J_{n-1}(x) - J_{n+1}(x)]$ ii) $J_n(x) = \frac{x}{2n}[J_{n-1}(x) + J_{n+1}(x)]$

a) only i) true b) only ii) true c) both true d)both false

Ans c

Q15.cos (xsin θ) = $J_0(x) + 2[\,J_2(x)$ cos 2 $\theta + J_4(x)$ cos 4 θ +-------].this is known as ,

a) sine series b) jacobi series c) general solution d) all of the above

Ans b

<u>**Unit-II**</u>

Q16. Laplace transform of $\{t^3\}$ =----------

a) $3!/s^4$ b) $4!/s^3$ c) $5!/s^4$ d) $4!/s^5$

Ans a

Q17. Identify the following property;

If a & b are any constants and f & g are functions of t , t> 0 then ,

L{a f(t) +b g(t) }= a L{f(t)}+bL{g(t)}

a) Ist shifting b)linearity c)change of scale d)none of these

Ans b

Q18 . a function f(t) is said to be periodic with period p if ,

a) f(t +p) = f(t) b)f (t-p) = f(t) c) f(2t-p) = f(t) d)all of the above

Ans a

Q19. If L{sint/t} = $\tan^{-1}(1/S)$ then L{sinat/t} =?

a) $\cot^{-1}$ (a/s) b) $\tan^{-1}$(a/s) c) $\cos^{-1}$(a/s) d) none of these

Ans b

Q20. L{sinh2t} =?

a) $\frac{2}{s^2-2^2}$ b) $\frac{2}{s^2+2^2}$ c) $\frac{s}{s^2+3^2}$ d) $\frac{s}{s^2-3^2}$

Ans a

Q21.name the thm.; Let L{f(t)} =F(s) then ,$\lim_{t\to 0} f(t) = \lim_{s\to\infty} SF(s)$ is-----

a)convolution thm. b) initial value thm. c)final value thm. d) none of these

Ans b

Q22. L^{-1} {1/s} =

a) 1 b)t c) $\frac{t^n}{n!}$ d) $t^2/3$

Ans a

Q23. Laplace transform of a function f(t) is expressed by formula;

a) $\int_0^\infty f(t)e^{st}$ dt b) $\int_1^\infty f(t)e^{st}$ dt c) $\int_0^\infty f(t)e^{-st}$ dt d) $\int_1^\infty f(t)e^{-st}$ dt

Ans c

Q24. Name the following property?

If $L^{-1}\{F(s)\}= f(t)$ then $L^{-1}\{e^{-as} F(s)\} = \begin{cases} f(t-a), & t > a \\ 0, & t < a \end{cases}$

a) Ist shifting b)IInd shifting c)change of scale d)multiplication by s

Ans b

Q25. $L^{-1}\{\frac{1}{(s-2)^3}\}$ =--------------

a) $\frac{t^2e^{2t}}{2}$ b) $\frac{t^2e^{-2t}}{2}$ c) $\frac{t^3e^{2t}}{3}$ d) $t^4/4$

Ans b

Q26. Find the value of $L\{\int_0^t \frac{sinu}{u}du\}$

a) $1/s \cot^{-1} 1/s$ b) $\tan^{-1}1/s$ c) $\cos^{-1}1/s$ d) $1/s \tan^{-1}1/s$

Ans d

Q27.choose the correct property;

If $L^{-1}\{F(s)\} = f(t)$ then $L^{-1}\{\frac{F(s)}{s}\} = \int_o^t f(u)du$

a) multiplication by s b)convolution c)division by s d) linearity

Ans c

Q28. Evaluate $\int_0^\infty t\, e^{-3t}\sin t\, dt$

a) 3/50 b) 55/3 c) 3/100 d) 2/55

Ans a

Q29.if $L\{f(t)\} = \frac{e^{-2/s}}{s}$ then find $L\{f(3t)\}$ =----------

a) $\frac{e^{3/s}}{s}$ b) $\frac{e^{-6/s}}{s}$ c) $\frac{e^4}{s}$ d) $\frac{e^8}{s}$

Ans b

Q30.$L\{e^{4t} \cos 2t\}$ =

a) $\frac{s+4}{(s+4)^2-2^2}$ b) $\frac{s+2}{(s-4)^2}$ c) $\frac{s-4}{(s-4)^2+4}$

d) $\frac{s-2}{s-2)^2-2^2}$

Ans c

Unit-III

Q. 1 : Which of the following is not Dirichlet's condition for the Fourier series expansion?

a) f(x) is periodic, single valued, finite

b) f(x) has finite number of discontinuities in only one period

c) f(x) has finite number of maxima and minima

d) f(x) is a periodic, single valued, finite

Ans : d

Q.2 : At the point of discontinuity, sum of the series is equal to

a) $\frac{1}{2}[f(x+) - f(x-)]$

b) $\frac{1}{2}[f(x+) + f(x-)]$

c) $\frac{1}{4}[f(x+) - f(x-)]$

d) $\frac{1}{4}[f(x+) + f(x-)]$

Ans : b

Q.3 : What is the Fourier series expansion of the function f(x) in the interval (c, c + 2π)?

a) $\frac{a_0}{2} + \sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$

b) $a_0 + \sum_{n=1}^{\infty}(a_n \cos nx + b_n \sin nx)$

c) $\frac{a_0}{2} + \sum_{n=0}^{\infty}(a_n \cos nx + b_n \sin nx)$

d) $a_0 + \sum_{n=0}^{\infty}(a_n \cos nx + b_n \sin nx)$

Ans : a

Q.4 : If the function f(x) is even, then which of the following is zero?

a) a_n

b) b_n

c) a_0

d) None of the above

Ans : b

Q.5 : If the function f(x) is odd, then which of the only coefficient is present?

a) a_n

b) b_n

c) a_0

d) All of the above

Ans : b

Q.6 : Find a_0 of the function f(x) = e^{-x} in $0 \le x \le 2\pi$

a) $\frac{1}{\pi}[1 - e^{-2\pi}]$

b) $-\frac{1}{\pi}[1 - e^{-2\pi}]$

c) $\frac{1}{\pi}[1 + e^{-2\pi}]$

d) $-\frac{1}{\pi}[1 + e^{-2\pi}]$

Ans : a

Q.7 : Find a_0 of the function $f(x) = \frac{1}{4}(\pi - x)^2$ in $0 \le x \le 2\pi$

a) $\frac{\pi^2}{6}$

b) $\frac{\pi^2}{12}$

a) $5\frac{\pi^2}{6}$

a) $5\frac{\pi^2}{12}$

Ans : a

Q.8 : What are Fourier coefficients?

a) The terms that are present in fourier series.

b) The terms that are obtained through fourier series

c) The terms which consist of the fourier series along with their sine or cosine values

d) None of the above

Ans : c

Q.9 : Which are the fourier coefficients in the following?

a) $a_{0,}$ $a_{n,}$ and b_n

b) a_n

c) b_n

d) a_n and b_n

Ans : a

Q.10 : Who discovered Fourier series?

a) Jean Baptiste de Fourier

b) Jean Baptiste Joseph Fourier

c) Fourier Joseph

d) Jean Fourier

Ans : b

Q.11 : Which condition work as the sufficient conditions for the convergence of the Fourier series?

a) Dirichlet’s conditions

b) Gibbs phenomenon

c) Fourier conditions

d) Fourier Phenomenon

Ans : a

Q.12 : Which of the following functions are even?

a) cosx

b) sinx

c) x

d) All of the above

Ans : a

Q.13 : A function f(x) is said to be odd if

a) f(-x) = f(x)

b) f(x) = -f(x)

c) f(-x) = -f(x)

d) none of the above

Ans : c

Q.14 : The product of two even functions or two odd functions is

a) Even

b) Odd

c) Even as well as Odd

d) All of the above

Ans : a

Q.15 : Which of the following is cosine series?

a) $f(x) = \frac{a_0}{2} + \sum_{n=0}^{\infty} a_n cos \frac{n\pi x}{L}$

b) $f(x) = a_0 + \sum_{n=0}^{\infty} a_n cos \frac{n\pi x}{L}$

c) $f(x) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n cos \frac{n\pi x}{L}$

d) $f(x) = a_0 + \sum_{n=1}^{\infty} a_n cos \frac{n\pi x}{L}$

Ans : c