GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2022
MATHEMATICS-II
M201

TIME ALLOTTED: 3 Hrs **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

1.Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

		Marks	CO No.
1. (i)	Particular Integral of $(D^2+2)y=\cos 2x$ is (a) $\frac{\cos 2x}{2}$ (b) $\frac{\cos 2x}{-2}$ (c) $\frac{x\cos 2x}{-2}$ (d) $\frac{x\cos 2x}{2}$	1	CO3
(ii)	Integrating factor of $\frac{dy}{dx}-3y=\sin 2x$ is (a) e^{3x} (b) e^{-3x} (c) e^{x} (d) None of these	1	CO2
(iii)	If $L\{f(t)\}=F(s)$, then $L\{f(at)\}=?$ (a) $aF(s)$ (b) $\frac{1}{a}F(s)$ (c) $\frac{1}{a}F\left(\frac{s}{a}\right)$ (d) None of these	1	CO1
(iv)	Which of the following relation is false (a) $\Delta-\nabla\equiv\Delta\nabla$ (b) $E^{-1}\equiv I-\nabla$ (c) $\Delta+\nabla\equiv\Delta/\nabla$ (d) None of These	1	CO1

(v) $L\left\{\frac{e^{at}}{a}\right\} = ?$ 1 CO3

(a) $\frac{a}{s(s-a)}$

(b) $\frac{1}{a(s-a)}$

(c) $\frac{1}{s^2(s-a)}$

(d) None of these

(vi) In Trapezoidal rule of finding $\int_a^b f(x)\,dx$, f(x)is approximated by 1 CO1

(a) linear segment
(b) parabola
(c) circular sector
(d) part of ellipse

(vii) B(1/2, 1/2)= ? 1 CO2

(a) 1
(b) π
(c) 2π
(d) none of these

(vii) The ratio of absolute error and of the true value is called 1 CO1

(a) relative error
(b) absolute error
(c) truncation error
(d) None of These

(ix) Correct to 5 decimal places, 1.004355 is rounded to 1 CO2

(a) 1.00436
(b) 1.00435
(c) 1.004355
(d) none of these

(x) For the differential equation $f(x,y)\frac{dy}{dx} + g(x,y) = 0$ to be exact if 1 CO2

(a) $\frac{\partial f}{\partial y} = \frac{\partial g}{\partial x}$

(b) $\frac{\partial f}{\partial x} = \frac{\partial g}{\partial y}$

(c) $\frac{\partial^2 f}{\partial y^2} = \frac{\partial^2 g}{\partial x^2}$

(d) None of these

(xi) $\Gamma(3/2) = ?$ 1 CO2

(a) 1/2
(b) $\sqrt{\pi}$
(c) $\sqrt{\pi}/2$
(d) none of these

(xii) 1 CO1

The order and degree of the differential equation $\frac{d^2y}{dx^2} = \left\{y + \left(\frac{dy}{dx}\right)^2\right\}^{\frac{1}{4}}$ is

(a) 2,4
(b) 4,2
(c) 1,4
(d) None of these

GROUP – B
(Short Answer Type Questions)
(Answer any ***three*** of the following) **3 x 5 = 15**

		Marks	CO No.
2.	Solve $(xy^2 + 3e^{\frac{1}{x^3}})dx - x^2 ydy = 0$	5	CO3
3.	Evaluate $\int_0^{\frac{\pi}{2}} \sin^4 x \cos^5 x dx$	5	CO3
4.	If $L\{f(t)\} = \frac{s^2 - s + 1}{(2s+1)^2(s-1)}$, apply change scale property of Laplace transform to show that $L\{f(2t)\} = \frac{s^2 - 2s + 4}{4(s+1)^2(s-2)}$	5	CO3
5.	Use Newton's forward interpolation formula to compute f(1.2) from	5	CO3

x	1	2	3	4	5
y=f(x)	6	10	15	17	33

6.	Find $L^{-1}\{\log(s+2)/(s+3)\}$	5	CO2

GROUP – B
(Long Answer Type Questions)
(Answer any ***three*** of the following) **3 x 15 = 45**

		Marks	CO No.
7. a)	Apply method of variation of parameters to solve $\frac{d^2y}{dx^2} - 4y = e^{2x}$	7	CO3
b)	Solve $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} - y = x\cos(\log x)$	8	CO3
8. a)	Solve $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + y = x\sin x$	5	CO3
(b)	Solve $x^2 ydx - (x^3 + y^3)dy = 0$	5	CO3

(c)	Solve $\frac{dy}{dx}+\frac{y}{x}\log y=\frac{y}{x^2}(\log y)^2$	5	CO4
9. a)	State Convolution theorem	2	CO1
b)	Apply Convolution theorem to find $L^{-1}\left\{\frac{1}{(s^2+1)(s^2+4)}\right\}$	6	CO3
c)	Solve the differential equation by using Laplace Transform $\frac{d^2y}{dx^2}+y=8\cos x,\ y(0)=1, y'(0)=-1$	7	CO3
10. a)	Compute $\int_0^1 \frac{dx}{1+x^2}$ using trapezoidal rule of integration. Take n=6. Hence find the approximate value of π. Find the absolute error, relative error and relative percentage error considering π =22/7	8	CO3
b)	Compute $y(1.1)$ *and* $y(1.2)$ by Runge Kutta method of fourth order from the differential equation $\frac{dy}{dx}=y^2+x^2,\ y(1)=1$ *taking* $h=0.1$	7	CO3
11.a)	Compute $y(1.6)$ from the differential equation $\frac{dy}{dx}=y^2+xy,\ y(1)=1$ using Euler method taking h=0.2.	5	CO3
b)	Show that $D\equiv\frac{1}{h}\left[\Delta-\frac{\Delta^2}{2}+\frac{\Delta^3}{3}-.....\right]$	5	CO2
c)	Find $L^{-1}\left\{\frac{5s}{s^2+9}+\frac{2}{s^2+1}+\frac{1}{(s-2)(s-3)}\right\}$	5	CO2