Reg No.:_______________ Name:__________________________

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

SECOND SEMESTER B.TECH DEGREE EXAMINATION(S), DECEMBER 2019

Course Code: MA102

Course Name: DIFFERENTIAL EQUATIONS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks

1	Find a general solution of the ordinary differential equation $y'' + y = 0$	(3)
2	Reduce to first order and solve. $yy'' = 3(y')^2$.	(3)
3	Find the particular integral of $y'' - 4y' - 5y = 4\,cos2x$.	(3)
4	Using a suitable transformation, convert the differential equation $(x^2D^2 + xD + 1)y = logx$ into a linear differential equation with constant coefficients.	(3)
5	If $f(x)$ is a periodic function of period 2π defined in $[-\pi, \pi]$. Write down Euler's Formulas $a_0,\ a_n,\ b_n$ for $f(x)$.	(3)
6	Find the half range Fourier cosine series of the function $f(x) = x$ in the range $0 < x < 2$.	(3)
7	Find the PDE by eliminating arbitrary function φ from $xyz = \varphi(x + y + z)$.	(3)
8	Solve $(D + 2D')(D - 3D')^2 z = 0$.	(3)
9	Write any three assumptions involved in the derivation of one dimensional wave Equation.	(3)
10	A tightly stretched string of length l is fixed at both ends and pulled from its mid point to a height h and released from rest from this position. Write down the initial and boundary conditions.	(3)
11	Write all possible solutions of one dimensional heat equation.	(3)
12	Find the steady state temperature distribution in a rod of length l if the ends are kept at 0^0C and 100^0C.	(3)

PART B

Answer six questions,one full question from each module

Module 1

13	a)	Solve $y'' - 2y' + y = 0,\ y(0) = 1,\ y'(0) = 2$.	(6)
	b)	Find a basis of solutions of the ODE $(x^2 - x)y'' - xy' + y = 0$, if y_1= x is a	(5)

solution.

OR

14 a) Solve the ordinary differential equation $y''' - 3y'' - 4y' + 6y = 0.$ (6)

b) Solve the ordinary differential equation $xy'' + 2y' + xy = 0,$ given that $y_1 = \frac{sinx}{x}$ is a solution. (5)

Module 1I

15 a) By the method of variation of parameters, solve $y'' + 4y = tan2x.$ (6)

b) Solve $y'' + 2y = x^2e^{3x}$. (5)

OR

16 a) Solve $(x+3)^2y'' - 4(x+3)y' + 6y = 3x.$ (6)

b) Solve $x^2y'' - 4xy' + 6y = x^5.$ (5)

Module 1II

17 a) Find the Fourier series of f defined by $f(x) = x - x^2$ in $(-1,1).$ (6)

b) Expand $f(x) = c$ in the half range sine-series in $0 \le x \le \pi.$ (5)

OR

18 Obtain Fourier series for the function $f(x) = |cosx|, -\pi \le x \le \pi.$ (11)

Module 1V

19 a) Solve $r + s + 2t = e^{x+y}.$ (6)

b) Find the general solution of $x^2(y-z)p + y^2(z-x)q = (x-y)z^2.$ (5)

OR

20 a) Solve $(D^3 + D^2D' - DD'^2 - D'^3)z = e^x \cos 2y$ (6)

b) Solve $(D^2 + 3DD' + 2D'^2)z = x^2y^2$ (5)

Module V

21 A uniform elastic string of length 60 cm is subjected to a constant tension of 2 Kg. If the ends are fixed, the initial displacement $u(x,0) = 60x - x^2, 0 < x < 60$ and the initial velocity is zero, find the displacement function $u(x,t)$ (10)

OR

22 Find the deflection of the vibrating string which is fixed at the ends $x = 0$ and $x = 2$ and the motion is started by displacing the string into the form $\sin^3(\frac{\pi x}{2})$ and released it with zero initial velocity at $t = 0$. (10)

Module VI

23 Find the temperature distribution in a rod of length $2m$ whose endpoints are maintained at temperature zero and initial temperature is $f(x) = 100(2x - x^2)$. (10)

OR

24 A rod of length 30cm has its ends A and B kept at $20^0C$and 80^0Crespectively until steady state temperature prevails. Suddenly the temperature at A is raised to 60^0C and the end B is decreased to 40^0C . Find the temperature distribution in the rod at time t. (10)

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