Prince Sultan University

Deanship of Educational Services Department of Mathematics and General Sciences



COURSE DETAILS:

DIFFERENT	TIAL EQUATIONS	MATH 225	FINAL EXAM
Semester:	Spring SemesterTerm	172	
Date:	Saturday, May 05, 2018		
Time Allowed: 180 minutes			

STUDENT DETAILS:

Student Name:	
Student ID Number:	
Section:	640, 159
Instructor's Name:	J. Alzabut

INSTRUCTIONS:

- You may use a scientific calculator that does not have programming or graphing capabilities. NO borrowing calculators.
- NO talking or looking around during the examination.
- NO mobile phones. If your mobile is seen or heard, your exam will be taken immediately.
- Show all your work and be organized.
- You may use the back of the pages for extra space, but be sure to indicate that on the page with the problem.

GRADING:

	Page 2	Page 3 Page 4 Page 5		Page 5	Page 6	Total		
Questions	Q.1 (12 pts)	Q.2, Q.3 (18 pts)	Q.4 (16 pts)	Q.5, Q.6 (18 pts)	Q.7, Q.8 (16 pts)	80		
Student Marks								

40	

Q.1 (4+8 points) Consider the equation

$$x\frac{dy}{dx} + y = 2x^4y^4 \tag{I}$$

a) Show that the substitution $v = y^{-3}$ transforms equation (I) into the differential equation

$$\frac{dv}{dx} - \frac{3}{x}v = -6x^3.$$
 (II)

b) Solve equation (II) and find a particular solution of equation (I) with y(1) = 1 in the form $y^3 = f(x)$.

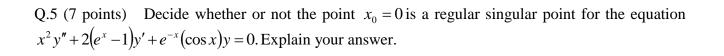
Q.2 (8 points) Show that the functions $y_1(x) = \sin 4x$ and $y_2(x) = \cos 4x$ are solutions of the equation y'' + 16y = 0 and form a fundamental set of solutions.

Q.3 (10 points) Solve the equation $xy^3 dx + (x^2y^2 + 1)dy = 0$.

(1/	(7±0 ±	nointe)	Consider	the IV	D v"	$\perp v' - 2$	a^{x}	(0) - 0) v'	(0)	_ 1
ļ	J.4 ((1+9)	pomis)	Consider	me i v	Py.	+ y = 20	e, y	(0) = 0	J, Y	(U)	= 1

a) Find the general solution of IVP by using method of undetermined coefficients.

b) Find the general solution of the IVP by using method of Laplace transform.



Q.6 (11 points) Use power series to solve the differential equation y'' - xy' - y = 0 around the ordinary point $x_0 = 0$.

Q.7 (7 points) Compute the Fourier sine series of $f(x) = 1$ on $0 \le x \le 1$. Find the coefficients explicitly and sketch its graph backward and forward for $-2 \le x \le 4$.	
Q.8 (9 points) Find the product solutions $u(x,t) = X(x).T(t)$ of the heat equation $u_t = 4u_{xx}$.	