RETEST for In-Class Test #1 (Module - ODE)

Engineering Mathematics for Advanced Studies

IIT Dharwad

Autumn 2019

Time - 25 minutes, 30th Oct. 2019
Maximum score - 20
Rule for absentee - This being a retest carries 30% penalty of final score. No futher retests.
Note:

1. Considering the time allotted for the quiz, to be on the safer side, student may want to first go through all questions and identify the ones that would not take much time to answer. Answer these first and then work on the relatively tedious questions.
2. Ensure to clearly write question number before the answer the question.
3. Worked out solutions on suppliments are must for some problems.
4. Please ensure to write Question number in a box as a heading to the upcoming answer on suppliments e.g.

Question 1

5. Unless mentioned y is a function of t i.e. $y(t)$ and $y'(t) = \frac{dy}{dt}$

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1. For the first order system given below please tick all of the appropriate choices: (marks 2)

$$\frac{dy}{dt} = 2 - y$$

   (a) $y = 2$ is stable equilibrium
   (b) $y = -2$ is stable point
   (c) $y = 2$ is saddle point
   (d) $y = 2$ is unstable equilibrium

2. True or False. (marks 8)

   (a) Following is Autonomous equation: $y' = ysin(t)$
   True/False: _____
   (b) Following is a second order differential equation: $yy' = sin(e^y)$
   True/False: _____
   (c) Following is a autonomous differential equation: $yy' = sin(e^y)$
   True/False: _____
   (d) Following is a linear differential equation: $(y')^2 - 3y * sin(t) = t - 1$
   True/False: _____
   (e) Following equation is a Bernouli equation: $y' = by^4$
   True/False: _____
   (f) Following equation is a Bernouli equation: $y' = bx^4$
   True/False: _____
   (g) Following is first order linear differential equation: $y' + 3logy = x$
   True/False: _____
   (h) Separable equation $\frac{dy}{dt} = \frac{t}{y^2}$ is solved by $\frac{1}{3}y^3 = \frac{1}{2}t^2$
   True/False: _____

3. What is the specific aspect of solving Bernouli equation? (marks 2)

4. Solve: $y' - 2y = \delta(2)$ with $y(0) = 1$ (marks 2)

5. Solve $y' - \sqrt{3}y = cos(t) + sin(t)$ with $y(0) = 1$ (marks 4)

6. Cooling is governed by Newton's law: (marks 2)

$$\frac{dT}{dt} = k(T_\infty - T)$$

   where $T_\infty$is ambience temperature, t is time and T is temperature at time t. Suppose the starting temperature difference between the object and ambience $T_0 - T_\infty$ is 80^o. After 90 minutes $T_1 - T_\infty$ is 20^o. At what time T we should expect temperature difference to be 10^o?