

6/10/2017

- Instructions :
- 1) All questions are compulsory.
  - 2) For Q.1, Q.2, Q.3 attempt any one subquestion (Each 8 mks) from part (a) and any three subquestions (each 4 marks) from part (b)
  - 3) for Q.4 Attempt any three (Each 5 mks.)

Q. 1 a) Attempt any one.

- 1) State Rule 3 and solve nonexact differential equation.

$$(x^2y^2 + xy + 1) dx + (x^2y^2 - xy + 1)xdy = 0$$

- 2) State and prove bernoulli differential equation and solve  $x \frac{dy}{dx} + y = y^2 \log x$ .

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b) Attempt any three. (each 4 marks)

- 1) Solve the differential equation  $(x - y)^2 dy = a^2 dx$ .

2) Solve :  $\left( y - x \frac{dy}{dx} \right) = m \left( y^2 + \frac{dy}{dx} \right)$

3) Solve :  $x \sin \frac{y}{x} \frac{dy}{dx} = y \sin \frac{y}{x} + x$

- 4) Solve differential equation  $(x + y) dy + (5x - 3y + 8) dx = 0$ .

Q. 2 a) Attempt any one.

- 1) State and prove method of variation of parameters.

- 2) Solve the differential equation by method of undetermined coefficient.

$$\frac{d^2y}{dx^2} - \frac{4dy}{dx} - 12y = 3e^{5x}$$

b) Attempt any three. (each 4 marks)

- 1) Prove that if  $y_g$  is general solution of the equation  $y'' + p(x)y' + q(x)y = 0$  and  $y_p$  is any particular solution of the equation.

2) Solve  $(y'' - 4y' + 4)y = \frac{e^{2x}}{x}$

3) Solve  $(D^2 + 2D + 4)y = 4x^2 + 3e^{-x}$

- 4) Determine whether the following functions  $y_1, y_2$  are linearly independent or not.

i)  $y_1 = \cos x$        $y_2 = \sin x$        $x \in \mathbb{R}$

ii)  $y_1 = x^2$        $y_2 = x^2 \log x$        $x \neq 0$

Q. 3 a) Attempt any one.

- 1) Using Taylor's method to solve the differential equation  $y' = 2x + y$   $y(0) = 0$ , on  $(0, 0.4)$  using tow subintervals of size 0.2.

- 2) Solve :  $y' = x^2 + y^2$   $y(0) = 0$  by picards method and estimate  $y(0.2)$ ,  $y(1)$ .

**b) Attempt any three. (each 4 marks)**

- 1) Use Runge Kutta method of second order to find  $y(0 - 1)$ ,  $y(0 - 2)$  for  $\frac{dy}{dx} = x - y$ ,  $y(0) = 1$
- 2) Given the equation  $y' = \frac{2y}{x}$   $y(1) = 2$  Estimate  $y(2)$  using Milne Simpson's Predictor corrector method. Assume  $h = 0.25$ .
- 3) Given equation  $y' = \frac{2y}{x}$   $y(1) = 2$  Estimate  $y(2)$  using Adam's Bashforth Mouttan Method
- 4) Estimate  $y(2)$  with  $h = 0.5$  for  $y' = 2x^2 + y$ ,  $y(1) = 1$  using polygon method.

**Q. 4 a) Attempt any three. (each 5 marks)**

- 1) Solve :  $2xy y' = y^2 - 2x^3$  given that  $y(1) = 2$ .
- 2) Find the current in series R-c circuit with  $R = 20\Omega$   $C = 0.01f$   $E(t) = 200 e^{-5t}$   $I(0) = 0$ .
- 3) Prove that if  $y_1(x)$  is non zero solution of the equation  $y'' + P(x) y' + Q(x) y = 0$ . Then

$y_2(x) = y_1(x) \int \frac{1}{y_1^2} e^{\int P(x) dx} dx$  is another solution of the equation so that  $y_1(x)$  and  $y_2(x)$  are linearly independent.

- 4) Find the other linearly independent solution to the differential equation.  $(1 - x^2) y'' - 2xy' + 2y = 0$  given  $y_1 = x$  is solution.
- 5) Prove that Euler's method and also Solve  $y' = x - y$   $y(0) = .$  Find  $y(0 - 1)$ ,  $y(0 - 2)$ ,  $y(0 - 3)$  by Euler's method.
- 6) Given  $y' = 2xy$ ,  $y(1) = 2$ . Estimate  $y(1.75)$  using Heu's method with  $h = 0.25$ .

— The End —