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.** 8

1) State Rule 3 and solve nonexact differential equation.
$(x^2y^2 + xy + 1)\,dx + (x^2y^2 - xy + 1)x\,dy = 0$

2) State and prove bernoulli differential equation and solve $x\dfrac{dy}{dx} + y = y^2 \log x$.
~~HK = KH~~.

b) **Attempt any three. (each 4 marks)** 12

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

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

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

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

Q. 2 a) **Attempt any one.** 8

1) State and prove method of variation of parameters.

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

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

b) **Attempt any three. (each 4 marks)** 12

1) Prove that if y_g is general solution of the equation $y^{11} + p(x)y^1 + q(x)y = 0$ and y_p is any particular solution of the equation.

2) Solve $(y^{11} - 4y^1 + 4)y = \dfrac{e^{2x}}{x}$

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) $y_1 = \cos x$ $\quad y_2 = \sin x$ $\quad x \in R$

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

Q. 3 a) **Attempt any one.** 8

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

2) Solve : $y^1 = x^2 + y^2$ $\quad y(0) = 0$ 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 $y^1 = \frac{2y}{x}$ y(1) = 2 Estimate y(2) using Milne Simpson's Predictor corrector method. Assume h = 0.25.

3) Given equation $y^1 = \frac{2y}{x}$ y(1) = 2 Estimate y(2) using Adam's Bashforth Mouttan Method

4) Estimate y(2) with h = 0.5 for $y^1 = 2x^2 + y$, y(1) = 1 using polygon method.

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

1) Solve : $2xy\, y^1 = y^2 - 2x^3$ given that y(1) = 2.
2) Find the current in series R-c circuit with R = 20Ω 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 $y^{11} + P(x) y^1 + Q(x) y = 0$. Then

$y_2(x) = y_1(x) \int \frac{1}{y^2} e^{spdex} dx$ 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. $(1 - x^2) y^{11} - 2xy^1 + 2y = 0$ given $y_1 = x$ is solution.
5) Prove that Euler's method and also Solve $y^1 = x - y$ y(0) = . Find y(0 – 1), y(0 – 2), y(0 – 3) by Euler's method.
6) Given $y^1 = 2xy$, y(1) = 2. Estimate y(1.75) using Heu's method with h= 0.25.

— The End —