1. The differential equation with all the initial conditions is specified at one point is called **[2 Marks]**
   (A) Boundary Value problem
   (B) Initial Value problem
   (C) None of these
   Ans: B CO:4 L-1

2. The error in approximating solution of initial value problem by Runge-kutta method is **[2 Marks]**
   (A) More than Taylor's series method and Modified Euler's method
   (B) Less than Taylor's series method and Modified Euler's method
   (C) Equal to Taylor's series method and Modified Euler's method
   (D) None of These
   Ans: B CO:4 L-1

3. A differential equation along with initial conditions are prescribed at two or more points is called **[2 Marks]**
   (A) Boundary Value problem
   (B) Initial Value problem
   (C) None of these
   Ans: A CO:5 L-1

4. For the DE $\frac{dy}{dx} = 1 + y^2$ with $y\,(0) = 0$ then $y\,(0.2)$ by Runge-Kutta Method is **[2 Marks]**
   (A) 0.2027
   (B) 0.3012
   (C) 0.2512
   (D) None of these
   Ans: A CO:4 L-3

5. If boundary conditions are not specified for a functional then the extremal is a **[2 Marks]**
   (A) Particular Solution of ODE
   (B) General Solution of ODE
   (C) Integral Equations
   (D) None of These
   Ans: B CO:5 L-1

6. The predictor formula is used to predict the value of y at x_{n+1} and the corrector formula is used to improve the value of y_{n+1}. **[2 Marks]**
   (A) True
   (B) False
   (C) None
   Ans: A CO:4 L-1

7. The error in the solution of differential equation increases if the step size h decreases **[2 Marks]**
   (A) True
   (B) False
   (C) None of these
   Ans: B CO:5 L-1

8. Which of the following methods are called multistep methods? **[2 Marks]**
   (A) Taylor's series method and Runge-kutta method
   (B) Modified Euler's method and Milne's method
   (C) Adams-Bash forth method and Milne's method
   (D) All of the above
   Ans: C CO:4 L-1

9. Euler's equation to find extremal of the functional is **[2 Marks]**
   (A) $\frac{\partial f}{\partial x} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$
   (B) $\frac{\partial f}{\partial y} - \frac{\partial}{\partial x}\left(\frac{\partial f}{\partial y'}\right) = 0$
   (C) $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y}\right) = 0$
   (D) $\frac{\partial f}{\partial y} - \frac{d}{dx}\left(\frac{\partial f}{\partial y'}\right) = 0$
   Ans: D CO:5 L-1

10. The extremal of the functional $\int_{x_2}^{x_1}(y^2 + x^2 y')\,dx$ is **[2 Marks]**
   (A) $y = -x$
   (B) $y = x^2$
   (C) $y = x$
   (D) None of the above

Ans: C CO:5 L-3

11. Given $\frac{dy}{dx} = \log_{10}(x+y), y(0) = 1$, using modified Euler's method, an approximate value of y(0.2), is

(A) 1.0626
(B) 0.3421
(C) 1.0082
(D) 0.0625 **[4 Marks]**

Ans: C CO:4 L-1

12. Given $\frac{dy}{dx} = xy^{\frac{1}{3}}, y(1) = 1$, using modified 4th order Runge-Kutta method, an approximate value of y(1.1), is

(A) 1.1068
(B) 0.1078
(C) 0.1008
(D) 2.1068 **[4 Marks]**

Ans: A CO:4 L-3

13. Given $\frac{dy}{dx} = x - y^2$, and the initial values as in the table below, using

x	0	0.1	0.2	0.3
y	1	0.9117	0.8494	0.8061

Adam's-Bashforth predictor-corrector method, an approximate value of y(0.4) is **[4 Marks]**

(A) 0.7785
(B) 0.6684
(C) 0.7001
(D) none

Ans: A CO:4 L-3

14. The extremal of the functional $\int_0^1 [y + x^2 + \frac{y'^2}{4}]\, dx, y(0) = 0, y(1) = 0$ is extremized as

(A) $y = 4(x^2 - x)$
(B) $y = 3(x^2 - x)$

(C) $y = 2(x^2 - x)$

(D) $y = x^2 - x$ **[4 Marks]**

Ans: D CO:5 L-3

15. On the interval [0,1], let y be an extremal of the functional $I(y) = \int_0^1 \frac{\sqrt{1+2y'^2}}{x} dx\, , when\ y(0) = 1, y(1) = 2$. Then for some arbitrary constant c, y satisfies

(A) $y'^2(2 - c^2x^2) = c^2x^2$

(B) $y'^2(2 + c^2x^2) = c^2y^2$

(C) $y'^2(1 - c^2x^2) = c^2x^2$

(D) $y'^2(1 + c^2x^2) = c^2x^2$ **[4 Marks]**

Ans: A CO:5 L-3

16. Given $\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0, y(0) = 1, y(0.1) = 0.995,\ y(0.2) = 0.9802,$ $y(0.3) = 0.956, y'(0) = 0,\ y'(0.1) = -0.0995, y'(0.2) = -0.196,$ $y'(0.3) = -0.2863$. Then by Milne's method, an approximate value of y(0.4) is

(A) -0.3692

(B) 0.9232

(C) -0.7754

(D) None of these **[5 Marks]**

Ans: B CO:5 L-3

17. The extremal of the functional $I(y) = \int_0^{\frac{\pi}{2}} [y^2 - y'^2 - 2y\sin x]\, dx,$ $y(0) = 0, y\left(\frac{\pi}{2}\right) = 1$ is given by

(A) $y = \sin x - \frac{x}{2}\cos x$

(B) $y = \sin x - \frac{x-\pi}{2}\cos x$

(C) $y = \sin x - x^2 \cos x$

(D) $y = (x - \frac{\pi}{2} + 1)\sin x - x\cos x$ **[5 Marks]**

Ans: A CO:5 L-3

Answers

1 B	2 B	3 A	4 B
5 B	6 A	7 B	8 C
9 D	10 C	11 C	12 A
13 A	14 D	15 A	16 B
17 A			