

Question Paper consists of FIVE units, each carrying 14 marks
Each unit has TWO questions; either of them should be answered
All parts of a question must be answered at one place

- 1.a) Find a real root of the equation $e^x \sin x = 1$ by using Regula - Falsi method. (7M)
1.b) Determine a real root of the equation $2x = \cos x + 3$ by using Newton - Raphson method. (7M)

(OR)

- 1.c) Obtain real root of the equation $x^3 - 6x - 4 = 0$ by using Iterative method. (7M)
1.d) Find a real root of the equation $x^3 - 2x^2 + 3x - 5 = 0$ using bisection method. (7M)

- 2.a) The following data gives the relation between the numbers of engineers(in thousands) produced in various engineering colleges in a certain state in years, (7M)

X(years)	1890	1910	1930	1950	1970
Y(no.of engineers)	236	298	389	687	1256

- Find the number of engineers in the year 1956 using appropriate interpolation formula.
2.b) Fit a interpolation polynomial for the given data (7M)

X	0	2	5
Y	10	12	60

By using Lagrange's interpolation formula.

(OR)

- 2.c) The velocity v (km/min) of a mopped which starts from rests, is given at fixed intervals of time (min) as follows (7M)

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

Estimate the approximately the distance covered in 20 min. using Simpson's $1/3^{\text{rd}}$ rule.

- 2.d) Evaluate the integral $\int_0^1 \sqrt{1+x^3} dx$ by using Trapezoidal rule taking $h = 0.1$. (7M)

- 3.a) Solve the differential equation $y' = x + y^2$, $y(0) = 1$ by using Euler's Modified method and hence evaluate the values of y at $x = 0.02, 0.04$ and 0.06 . (14M)

(OR)

- 3.c) Solve the differential equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$ by using Runge - Kutta fourth order method and hence evaluate $y(0.2)$, $y(0.4)$ and $y(0.6)$. (14M)

- 4.a) Evaluate $\int_0^{\infty} \frac{x^4(1+x^5)}{(1+x)^{15}} dx$. by using $\beta - \Gamma$ function. (7M)
- 4.b) Evaluate $\int_0^{\pi/2} \sin^5 \theta \cos^{7/2} \theta d\theta$. (7M)
- (OR)
- 4.c) Evaluate $\int_0^{\infty} e^{-x^2} x^2 dx$. (7M)
- 4.d) Evaluate $\int_0^2 x^7(1-x)^5 dx$. (7M)
- 5.a) Determine whether the function $f(z) = xy^2 + i xy$ is continuous or not? (7M)
- 5.b) If $u = \frac{\sin 2x}{\cosh 2y - \cos 2x}$ is a real part of an analytic function $f(z)$, then find analytic function $f(z)$ using Milne - Thomson method. (7M)
- (OR)
- 5.c) Evaluate $\int_C \frac{e^{2z}}{(z-1)(z-2)} dz$, where $C: |z|=3$ using Cauchy's integral formula. (7M)
- 5.d) Expand $f(z) = e^z$ in Taylor's series about $z = 1$. (7M)

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Final GPT

[Signature] 11/11/22