SECTION – D

Answer **any 2** questions out of 4 questions. **Each** question carries **6** marks.

27. Find a root of the equation $\sin x = 1 - x$ using Ramanujan's method.

28. Prove that $\Delta - \nabla = \delta^2$.

29. The table below gives the values of $\tan x$ for $0.10 \le x \le 0.30$

x	y = tan x
0.10	0.1003
0.15	0.1511
0.20	0.2027
0.25	0.2553
0.30	0.3093

Find $\tan(0.12)$.

30. Using Simpson's rule and trapezoidal rule with $h = 0.125$, evaluate $I = \int\limits_0^1 \frac{1}{1+x} dx$.

$(2 \times 6 = 12)$

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Reg. No. : ....

Name : ....

IV Semester B.Sc. Hon's (Mathematics) Degree (Regular/Supple./Improv.) Examination, May 2018
BHM 405 : NUMERICAL ANALYSIS
(2016 Admission Onwards)

Time : 3 Hours   Max. Marks : 60

SECTION – A

Instruction : Any 4 out of 5 questions. **Each** question carries **1** mark.

1. Define transcendental functions.

2. Define first forward differences.

3. Define Newton's general interpolation formula with divided differences.

4. Define trapezoidal rule.

5. Define Gauss' forward formula. $(1 \times 4 = 4)$

SECTION – B

Answer **any 6** questions out of 9 questions. **Each** question carries **2** marks.

6. Given that the equation $x^{2.2} = 69$ has a root between 5 and 8. Use the method of regula-falsi to determine it.

7. Use the Newton-Raphson method to find a real root of the equation $x = e^{-x}$.

8. Define the operators Δ, ∇ and E and show that $\Delta = E \nabla$.

9. Show that $\delta = E^{\frac{1}{2}} - E^{-\frac{1}{2}}$.

10. Find the cubic polynomial which taken the following values $y(1) = 24$, $y(3) = 120$, $y(5) = 336$ and $y(7) = 720$.

P.T.O.

11. If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$, find x.

12. Certain corresponding values of x and $\log_{10} x$ are (300, 2.4771), (304, 2.4829), (305, 2.4843) and (307, 2.4871). Find $\log_{10} 301$.

13. Evaluate $\int_0^\pi t \sin t \, dt$.

14. Evaluate $\int_0^{\frac{\pi}{2}} \sqrt{\sin\theta} \, d\theta$ using Simpson's rule with $h = \frac{\pi}{12}$. $\qquad$ (6×2=12)

SECTION – C

Answer **any 8** questions out of 12 questions. **Each** question carries **4** marks.

15. Find a real root of the equation $f(x) = x^3 - x - 1 = 0$ using Bisection method.

16. Use the method of iteration to find a positive root between 0 and 1 of the equation $xe^x = 1$.

17. Using Ramanujan's method, find a real root of the equation

$$1 - x + \frac{x^2}{(2!)^2} - \frac{x^3}{(3!)^2} + \frac{x^4}{(4!)^2} - \ldots = 0.$$

18. Prove that $\mu^2 = 1 + \frac{1}{4}\delta^2$.

19. Using the method of separation of symbols show that

$$\Delta^n u_{x-n} = u_x - n u_{x-1} + \frac{n(n-1)}{2} u_{x-2} + \ldots + (-1)^n u_{x-n}.$$

20. Define the operator D and prove that $E \equiv e^{hD}$.

21. The function $y = \sin x$ is tabulated below :

x	$y = \sin x$
0	0
$\frac{\pi}{4}$	0.70711
$\frac{\pi}{2}$	1.0

Using Lagrange's interpolation formula, find the value of $\sin\left(\frac{\pi}{6}\right)$.

22. Using the following table find f(x) as a polynomial in x.

x	f(x)
−1	3
0	−6
3	39
6	822
7	1611

with Newton's general interpolation formula.

23. Derive Newton's forward difference interpolation formula.

24. From the following table of values of x and y find $\frac{dy}{dx}$ at x = 1.6.

x	y
1.0	2.7183
1.2	3.3201
1.4	4.0552
1.6	4.9530
1.8	6.0496
2.0	7.3891
2.2	9.0250

25. Compute the value of $I = \int_0^1 \frac{dx}{1+x^2}$ by using trapezoidal rule with h = 0.5.

26. Derive Simpson's $\left(\frac{3}{8}\right)$ rule. $\qquad$ (8×4=32)