SHARAD MATH SCHOLER – 2018
Round – 02

Question Booklet Version	SHARAD MATH SCHOLAR -2018 Roll No.	Question Booklet Sr. No.
D (Write this number on your Answer sheet)	Answer Sheet No.	(Write this number on your Answer sheet)

Day and Date : **Saturday , 21st April 2018** Duration: **1.30 hours** Total Marks : **100**

This is to certify that, the entries of SHARAD MATH SCHOLAR -2018 Roll No. and Answer Sheet No. have been correctly written and verified.

Candidate's Signature *Invigilator's Signature*

Instructions to Candidates

1. This question booklet contains 50 Objective Type Questions in the subjects of Mathematics.
2. The question paper and OMR (Optical Mark Reader) Answer Sheet is issued separately at the start of the examination.
3. Choice and sequence for attempting questions will be as per the convenience of the candidate.
4. Candidate should carefully read the instructions printed on the Question Booklet and Answer Sheet and make the correct entries on the Answer Sheet. As Answer Sheets are designed to suit the OPTICAL MARK READER (OMR) SYSTEM, special care should be taken to mark the entries correctly. Special care should be taken to fill QUESTION BOOKLET VERSION, SERIAL No. and SHARAD MATH SCHOLAR -2018 Roll No. accurately.
   The correctness of entries has to be cross-checked by the invigilators. The candidate must sign on the Answer Sheet and Question Booklet.
5. Read each question carefully.
6. Select the correct answer from the four available options given for each question.
7. Mark the appropriate circle completely like this ● , for answering a particular question.
   Mark with Black ink ball point pen only.
8. Each question with correct response shall be awarded Two (2) marks. **No negative marking.**
9. Use of whitener or any other material to erase/hide the circle once filled is not permitted.
10. Avoid overwriting and/or striking of answers once marked.
11. Rough work should be done only on the blank space provided on the Question Booklet. Rough work should not be done on the Answer Sheet.
12. Immediately after the prescribed examination time is over, the Question Booklet and Answer sheet is to be returned to the Invigilator. Confirm that both the Candidate and Invigilator have signed on question booklet and answer sheet.
13. No candidate is allowed to leave the examination hall till the end of examination.

1. $The\ area\ of\ region\ bounded\ by\ ellipse\ \frac{x^2}{9}+\frac{y^2}{4}=1\ \ is \ldots..$

(A) $36\pi\ sq.units$ (B) $\frac{36\pi}{5}$ sq. units

(C) $6\pi\ sq.units$ (D) $6\pi^2\ sq.units$

2. $The\ order\ \&\ degree\ of\ the\ differential\ equation$

$$\sqrt{\frac{dy}{dx}}-4\frac{dy}{dx}-7x=0\ \ is\ \ \ldots\ldots$$

(A) $1\ \&\frac{1}{2}$ (B) $2\ \&\ 1$

(C) $1\ \&\ 2$ (D) $1\ \&\ 1$

3. $If\ three\ fair\ coins\ are\ tossed\ where\ \ X=no.of\ Heads\ obtained\ ,$
$then\ E(X) is \ldots\ldots\ldots..$

(A) $\frac{1}{2}$ (B) $\frac{3}{2}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

4) If $F(x) = \begin{cases} \frac{x^2-x-6}{x-3} & \text{where } x \neq 3 \\ 7 & when\ x=3 \end{cases}$ is discontinuous at x = ...

(A) x = 4 (B) x = 5

(C) x = 3 (D) x = 2

5. $\frac{d}{dx}\left[cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right]\ \ is \ldots\ldots$

(A) $sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ (B) $\frac{2x}{1+x^2}.sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$

(C) $\frac{2x}{1+x^2}$ (D) $\frac{1}{1+x^2}$

P.T.O

6. Rolle's theorem is true for the function $f(x) = x^2 - 4$, in the interval is … …

(A) $[-2, 0]$ (B) $[-2, 2]$

(C) $\left[0, \frac{1}{2}\right]$ (D) $[0, 2]$

7. $\int \frac{dx}{9x^2 - 25}$

(A) $\frac{1}{30}\log\left|\frac{3x+5}{3x-5}\right| + c$ (B) $\frac{1}{27}\log\left|\frac{3x-5}{3x+5}\right| + c$

(C) $\frac{1}{30}\log\left|\frac{3x-5}{3x+5}\right| + c$ (D) $\frac{1}{27}\log\left|\frac{3x+5}{3x-5}\right| + c$

8. The value of $\int_2^3 \frac{dx}{x^2 - x} = \cdots \ldots \ldots$

(A) $\log\left(\frac{2}{3}\right)$ (B) $\log\left(\frac{1}{4}\right)$

(C) $\log\left(\frac{8}{3}\right)$ (D) $\log\left(\frac{4}{3}\right)$

9. The area bounded by the curve $y^2 = 8x$ & *the straight line* $x = 2$ *is* ....

(A) $\frac{32}{3}$ *sq. units* (B) $\frac{23}{3}$ sq. units

(C) $\frac{16}{3}$ *sq. units* (D) $\frac{13}{2}$ *sq. units*

10. The differential equation of $y = a\cos(x + b)$ is … … ..

(A) $\frac{d^2y}{dx^2} - y = 0$ (B) $\frac{d^2y}{dx^2} + y = 0$

(C) $\frac{d^2y}{dx^2} + 2y = 0$ (D) *none of these*

P.T.O

11. A dice is thrown five times , then the probability that an even no will come up exactly three times is … … … … ….

(A) $\frac{5}{16}$ (B) $\frac{1}{2}$

(C) $\frac{3}{16}$ (D) $\frac{3}{2}$

12. $If\ f(x) is\ continuous\ \&\ g(x) is\ a\ discontinuous\ function$, $then\ f(x) - g(x)$ … … ….

(A) $is\ a\ continuous\ function$ (B) $is\ a\ discontinuous\ function$

(C) $may\ or\ may\ not\ be\ continuous$ (D) $is\ continous\ at\ some\ point$

13. $\frac{d}{dx}\left[sin^{-1}\left(\sqrt{\frac{(1-x)}{2}}\right)\right]$ is … … … … ….

(A) $\frac{1}{\sqrt{1-x^2}}$ (B) $\frac{-1}{\sqrt{1-x^2}}$

(C) $\frac{-1}{2\sqrt{1-x^2}}$ (D) $\frac{1}{\sqrt{2(1-x^2)}}$

14. If minimum value for $f(x) = 7 - 20x + 11x^2$ is … ..

(A) $\frac{177}{11}$ (B) $-\frac{177}{11}$

(C) $-\frac{23}{11}$ (D) $\frac{23}{11}$

15. $\int x \log x \ dx = \cdots$ … … ….

(A) $\frac{1}{4}x^2(2logx - 1) + c$ (B) $\frac{1}{2}x^2(logx - 1) + c$

(C) $\frac{1}{2}x^2(logx^2 - 1) + c$ (D) $2x^2(logx - 1) + c$

P.T.O

16. If $I = \int_0^{\frac{\pi}{2}} \frac{\sqrt[3]{\cos x}}{\sqrt[3]{\sin x} + \sqrt[3]{\cos x}}\, dx = \ldots\ldots\ldots$

(A) 0 (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{4}$ (D) *none of these*

17. Integrating factor of $\frac{dy}{dx} + \frac{y}{x} = x^3 - 3$ is ………..

(A) x (B) $logx$

(C) $-x$ (D) e^x

18. If $y = x^2 + x^{\log x}$, then $\frac{dy}{dx} = \cdots \ldots$

(A) $2x + \frac{2}{x} . \log x$ (B) $2x + \frac{x}{2} . \log x$

(C) $2x + \frac{2}{x} . \log x . (x^{\log x})$ (D) none of these

19. $\int \frac{x-1}{(x-3)(x-2)} dx = \cdots \ldots \ldots .$

(A) $\log(x-3) - \log(x-2) + c$

(B) $\log(x-3)^2 - \log(x-2) + c$

(C) $\log(x-3) + \log(x-2) + c$

(D) $\log(x-3)^2 + \log(x-2) + c$

20. *The solution of differential equation* $x\log x \frac{dy}{dx} + y = 2\log x$ *is* ..

(A) $y = \log x + c$ (B) $y = \log x^2 + c$

(C) $y\log x = (\log x)^2 + c$ (D) $y = x\log x + c$

P.T.O

21. The statement pattern $(p \wedge q) \rightarrow p$ is ……….

(A) a contradiction (B) a tautology

(C) either (A)or (B) (D) contingency

22. $If\ A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}\ \&\ A^2 = I\ , then\ A^{-1}\ is\ \ldots\ldots\ldots\ldots$

(A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

23. The general solution of $\tan 3x = 1$ is ($n \in I$)is ……….

(A) $n\pi + \frac{\pi}{4}$ (B) $n\pi$

(C) $\frac{n\pi}{3} + \frac{\pi}{12}$ (D) $n\pi \pm \frac{\pi}{4}$

24. *The separate equation of pair of lines whose equation is* $x^2 + xy - 12y^2 = 0$ *are* ……………

(A) $x + 4y = 0\ \&\ x + 3y = 0$ (B) $2x - 3y = 0\ \&\ x - 4y = 0$

(C) $x - 6y = 0\ \&\ x - 3y = 0$ (D) $x + 4y = 0\ \&\ x - 3y = 0$

25. If A(2 , 3 , −4), B (m , 1 , −1), C (3 , 2 , 2)& G (3, 2, n)is the centroid of ΔABC , then the value of m & n *are* ……

(A) −4 , 1 (B) 4 , −1

(C) 4 , 3 (D) 3 , 4

26. If a line has d. r. s. $\sqrt{2}, -\sqrt{5}, \sqrt{2}$, then its d. c. s are …………

(A) $\sqrt{5}, -\sqrt{2}, \sqrt{5}$ (B) $\frac{\sqrt{2}}{5}, -\frac{\sqrt{5}}{5}, \frac{\sqrt{2}}{5}$

(C) $\frac{\sqrt{2}}{3}, -\frac{\sqrt{5}}{3}, \frac{\sqrt{2}}{3}$ (D) $\sqrt{2}, \sqrt{5}, \sqrt{2}$

P.T.O

27. The shortest distance between the lines $\frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1}$ & $\frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1}$ is

(A) $2\sqrt{29}$ (B) $\sqrt{29}$

(C) $3\sqrt{29}$ (D) $5\sqrt{29}$

28. The equation of the straight line passing through $(4 , -5 , -2)$& $(-1 , 5, 3)$ is … … … … … …

(A) $\frac{x}{-1} = \frac{y}{5} = \frac{z}{3}$ (B) $\frac{x+1}{1} = \frac{y-5}{2} = \frac{z-3}{-1}$

(C) $\frac{x-4}{1} = \frac{y+5}{-2} = \frac{z+2}{-1}$ (D) $\frac{x}{4} = \frac{y}{-5} = \frac{z}{-2}$

29. Angle between two planes $\bar{r}.\left(2\hat{i} - \hat{j} + \hat{k}\right) = 6$ & $\bar{r}.\left(\hat{i} + \hat{j} + 2\,\hat{k}\right) = 5$ is .

(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

30. *Using quantifier* $\forall$, $\exists$, Convert the following open statement into true statement. $x + 5 = 8$, $x \in N$

(A) $\forall\, x \in N , x + 5 = 8$ (B) For every $x \in N , x + 5 > 8$

(C) for every $x \in N , x + 5 < 8$ (D) $\exists\, x \in N$, such that $x + 5 = 8$

31. $If\ A = \begin{bmatrix} 1 & 2 & 3 \\ -3 & 2 & -1 \\ 2 & -4 & 3 \end{bmatrix}$ *then co – factor* A_{12} *is* … … … … …

(A) 2 (B) 8

(C) 7 (D) – 8

P.T.O

32. In a triangle ABC if $a = 2$, $b = 3$ & $sinA = \frac{2}{3}$, then $\cos C =$ ....

(A) $\frac{2}{3}$ (B) $\frac{1}{3}$

(C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{3}}$

33. The sum of the slopes of the lines represented by $x^2 - xy - 6y^2 = 0$ is … ….

(A) 6 (B) -6

(C) $-\frac{1}{6}$ (D) $\frac{1}{6}$

34. Let $\bar{a}$, $\bar{b}$ & $\bar{c}$ be three vectors . Then scalar triple product $[\bar{a} \quad \bar{b} \quad \bar{c}]$ is equal to … … … ..

(A) $[\bar{b} \quad \bar{a} \quad \bar{c}]$ (B) $[\bar{a} \quad \bar{c} \quad \bar{b}]$

(C) $[\bar{c} \quad \bar{b} \quad \bar{a}]$ (D) $[\bar{b} \quad \bar{c} \quad \bar{a}]$

35. The perpendicular distance between point (2 , 4 − 1) from the line

$\frac{x+5}{1} = \frac{y+3}{4} = \frac{z-6}{-9}$ is … … … … …

(A) 3 (B) **7**

(C) 5 (D) 9

36. The equation of plane passing through the point (3 , 2 , −1), (3 , 4 , 2) & (7 , 0 , 6) is $5x + 3y - 2z = \lambda$, where λ is … … …

(A) 23 (B) 21

(C) 19 (D) 27

37. *The direction ratios of two lines are* (5 , −12 , 13)& (−3 , 4 , 5), *then angle between them are* … … …

(A) $cos^{-1}\left(\frac{3}{65}\right)$ (B) $cos^{-1}\left(\frac{2}{65}\right)$

(C) $cos^{-1}\left(\frac{1}{65}\right)$ (D) $\frac{\pi}{2}$

P.T.O

38. A factory owner wants to perchase 2 types of machines A & B *for his factory* . The machine A requires area of 1000 m^2 & 12 *skilled men for running it & its* daily output is 50 units . The machine B requires area of 1200 m^2 & 8 *skilled* men for running it & *its daily output is* 40 *units* . *If area of* 7600 m^2 & 72 *skilled* men are available to operate the machines , set up as LPP to maximize the daily output .

A) Maximum $Z = 50x + 40y$, *subject to constraints* , $x \geq 0$, $y \geq 0$
$1000x + 1200y \leq 7600$, $12x + 8y \leq 72$

B) Maximum $Z = 50x + 40y$, *subject to constraints* , $x \geq 0$, $y \geq 0$
$1000x + 1200y \geq 7600$, $12x + 8y \leq 72$

C) Maximum $Z = 50x + 40y$, *subject to constraints* , $x \geq 0$, $y \geq 0$
$1000x + 1200y \leq 7600$, $12x + 8y \geq 72$

D) Maximum $Z = 50x + 40y$, *subject to constraints* , $x \geq 0$, $y \geq 0$
$1000x + 1200y \geq 7600$, $12x + 8y \geq 72$

39. The dual of the statement 'Mango & *Apple are sweet fruits* ' *is* ....

A) Mango & Apple are not sweet fruits .

B) Mango is sweet fruit but not Apple .

C) Apple is sweet fruit but not Mango .

D) Mango or Apple are sweet fruits .

40. *The value of a for which the system of equations* $ax + y + z = 0$, $x + ay + z = 0$, $x + y + z = 0$ *possess a non null solution is* … …

(A) 2 (B) 1

(C) -1 (D) -2

41. $\sin^{-1}\left(\frac{3}{5}\right) + \sin^{-1}\left(\frac{8}{17}\right) = \cdots$ … … … … … ..

(A) $\sin^{-1}\left(\frac{57}{85}\right)$ (B) $\sin^{-1}\left(\frac{47}{87}\right)$

(C) $\sin^{-1}\left(\frac{67}{85}\right)$ (D) $\sin^{-1}\left(\frac{77}{85}\right)$

P.T.O

42. If $2x^2 + 4xy - py^2 + 4x + qy + 1 = 0$ represent two straight lines at right angles to each other , then the value of p & q ..

(A) 1 , 2 or 6 (B) 2 , 0 or 6

(C) 2 , 0 or 8 (D) -2 , -2 or 8

43. *In regular hexagon ABCDEF* , $\overline{AE} = \cdots \ldots \ldots$

(A) $\overline{AC} + \overline{AF} + \overline{AB}$ (B) $\overline{AC} + \overline{AF} - \overline{AB}$

(C) $\overline{AC} + \overline{AB} - \overline{AF}$ (D) $\overline{AC} + \overline{AB} - 2\overline{AF}$

44. A line makes angle of 45° & 60° *with X & Z axes respectively .The angle* made by it with Y axis is … … … …

(A) 30° & 150° (B) 90°

(C) 45° & 135° (D) 60° & 120°

45. The distance of point (2 , 3 , 4) from the plane $3x - 6y + 2z + 11 = 0$

(A) **2** (B) **4**

(C) **1** (D) **3**

46. If f(x) is continuous at x= 1 ,

$$F(x)=\begin{cases} 2x+5 , & x>1 \\ k & x=1 \\ 8x-1 & x<1 \end{cases}$$

Then find k ..

(A) 7 (B) 5

(C) 2 (D) 8

47. If $y = e^{\sqrt{x}}$ then find $\frac{dy}{dx}$

(A) $\frac{\sqrt{x}}{e^{\sqrt{x}}}$ (B) $\frac{e^{\sqrt{x}}}{2\sqrt{x}}$

(C) $\frac{x}{e^{\sqrt{x}}}$ (D) $\frac{2\sqrt{x}}{e^{\sqrt{x}}}$

P.T.O

48. The approximate value of square root of 25.2 is ...

(A) 5.01 (B) 5.04

(C) 5.03 (D) 5.02

49. If $f'x = \frac{1}{x} + x$ & $f(1) = \frac{5}{2}$, then $f(x) = \cdots \ldots \ldots$

(A) $\log x - \frac{x^2}{2} + 2$ (B) $\log x + \frac{x^2}{2} + 1$

(C) $\log x + \frac{x^2}{2} + 2$ (D) $\log x - \frac{x^2}{2} + 1$

50. $\int_1^2 \frac{\cos(\log x)\ dx}{x} = \cdots \ldots \ldots \ldots$

(A) $\sin(log3)$ (B) $\sin(log2)$

(C) $\cos(log3)$ (D) *none of these*

END