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Time : 2.30 hrs.

11th Quarterly Examination - 2018

Reg. No.

MATHEMATICS

Max. Marks : 90

Instructions : 1) Check the question paper for fairness of printing. If there is any lack of fairness, inform the Hall Supervisor immediately. 2) Use Blue or Black ink to write and underline and pencil to draw diagrams.

SECTION - I

Note : i) Answer all the questions. **20 x 1 = 20**
ii) Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.

1. Let $f : R \to R$ is defined by $f(x) = 1 - |x|$, then the range of f is a) R b) $(1, \infty)$ c) $(-1, \infty)$ d) $(-\infty, 1]$
2. If $n(A) = 2$ and $n(B \cup C) = 3$ then $n[(A \times B) \times (A \times C)]$ is a) 1 b) 2 c) 3 d) 4
3. Let $f : R \to R$ be defined as $f(x) = x^4$. Choose the correct answer
a) f is one - one onto b) f is onto c) f is one - one but not onto d) f is neither one - one nor onto
4. Let $f : R \to R$ be given by $f(x) = (3 - x^3)^{\frac{1}{3}}$ then $fof(x)$ is a) $x^{1/3}$ b) x^3 c) x d) $3 - x^3$
5. If $\frac{1-2x}{3+2x-x^2} = \frac{A}{3-x} + \frac{B}{x+1}$, then the value of A + B is a) $-\frac{1}{2}$ b) $-\frac{2}{3}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$
6. The solution set of the following inequality $|x - 1| \geq |x - 3|$ is
a) [0, 2] b) $[2, \infty)$ c) (0, 2) d) $(-\infty, 2)$
7. The value of $\sqrt[4]{(-2)^4}$ = ... a) 2 b) −2 c) 4 d) −4
8. If $|x - 2| \geq 5$, then x belongs to
a) $(-\infty, -2] \cup [5, \infty)$ b) $(-\infty, -3] \cup [7, \infty)$ c) $(-\infty, -3) \cup (7, \infty)$ d) $(-\infty, -2) \cup (5, \infty)$
9. $\cos 1^0 + \cos 2^0 + \cos 3^0 + ... + \cos 179 =$ .... a) 0 b) 1 c) −1 d) 89
10. If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2 + ax + b = 0$ then $\frac{\sin(\alpha+\beta)}{\sin\alpha \sin\beta}$ is equal to a) $\frac{b}{a}$ b) $\frac{a}{b}$ c) $-\frac{a}{b}$ d) $-\frac{b}{a}$
11. If cosec A + cotA = $\frac{11}{2}$, then tanA is a) $\frac{21}{22}$ b) $\frac{15}{16}$ c) $\frac{44}{117}$ d) $\frac{117}{43}$
12. If $\sec\theta = x + \frac{1}{4x}$, then $\sec\theta + \tan\theta$ = a) $x, \frac{1}{x}$ b) $2x, \frac{1}{x}$ c) $-2x, \frac{1}{2x}$ d) $-\frac{1}{x}, x$
13. In 3 fingers, the number of ways four rings can be worn is........ways.
a) $4^3 - 1$ b) 3^4 c) 68 d) 64
14. The product of first n odd natural numbers equals
a) $2nC_n \times nP_n$ b) $\left(\frac{1}{2}\right)^n \times 2nC_n \times nP_n$ c) $\left(\frac{1}{4}\right)^n \times 2nC_n \times 2nP_n$ d) $nC_n \times nP_n$
15. Value of $\frac{7!}{2!}$ is a) 2520 b) 2250 c) 2205 d) 2052
16. The number of words that can be formed out of the letters of the word "COMMITTEE" is
a) $\frac{9!}{(2!)^3}$ b) $\frac{9!}{(2!)^2}$ c) $\frac{9!}{2!}$ d) 9!
17. The coefficient of x^6 in $(2 + 2x)^{10}$ is a) $10C_6$ b) 2^6 c) $10C_6 2^6$ d) $10C_6 2^{10}$
18. If $nC_{10} > nC_r$ for all possible r, then the value of n is a) 10 b) 21 c) 19 d) 20
19. Rank of the word "MOTHER" is a) 310 b) 300 c) 308 d) 309
20. If the co-efficient of x in $\left(x^2 + \frac{\lambda}{x}\right)^5$ is 270, then λ = a) 3 b) 4 c) 5 d) 6

SECTION - II

i) Answer any seven questions. ii) Question number 30 is compulsory. **7 x 2 = 14**

21. If $n(A \cap B) = 3$ and $n(A \cup B) = 10$ then find $n[P(A \Delta B)]$
22. In the set Z of integers, define mRn if m − n is a multiple of 12. Prove that R is an equivalence relation.
23. Find the domain and range of the real valued function $f(x) = \frac{5-x}{x-5}$

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24. Solve the equation $\sqrt{6-4x-x^2} = x+4$
25. Find the value of $\cos 105^0$
26. Solve : $\tan 2x = -\cot\left(x+\frac{\pi}{3}\right)$
27. Simplify : $\sin 100^0 + \cos 100^0$
28. If $10P_{r-1} = 2 \times 6P_r$, find r
29. Determine the number of 5 card combinations out of a deck of 52 cards if there is exactly three aces in each combination?
30. Compute : 9^7

SECTION - III

i) Answer any seven questions. ii) Question number 40 is compulsory **7 x 3 = 21**

31. Draw the graph of the functions $f(x) = |x|$, $f(x) = |x-1|$ and $f(x) = |x+1|$
32. If $f : R\{-1, 1\} \rightarrow R$ is defined by $f(x) = \frac{x}{x^2-1}$, verify whether f is one to one
33. If $\frac{\log x}{y-z} = \frac{\log y}{z-x} = \frac{\log z}{x-y}$, then prove that $xyz = 1$
34. Solve : $\frac{|x|-1}{|x|-3} \geq 0, x \in R, x \neq \pm 3$
35. If $A + B = 45^0$, then prove that $(1 + \tan A)(1 + \tan B) = 2$
36. If the sides of a ΔABC are, a = 4, b = 6 and c = 8 then show that $4\cos B + 3\cos C = 2$
37. Count the number of positive integers greater than 7000 and less than 8000 which are divisible by 5, provided that no digits are repeated.
38. If $(n+2)C_7 : (n-1)P_4 = 13 : 24$ then find the value of n
39. Find the rank of the word "SCHOOL". *CTEN*
40. Find the last two digits of the number 3^{600}.

SECTION - IV

Answer all the questions. **7 x 5 = 35**

41. a) If A x A has 16 elements, $S = \{(a, b) \in A \times A : a < b\}$, (–1, 2) and (0, 1) are two elements of S, then find the remaining lements of S. **(OR)** b) Resolve into partial fractions : $\frac{7+x}{(1+x)(1+x^2)}$
42. a) If $f : R \rightarrow R$ is defined by $f(x) = 3x - 5$, prove that f is a bijection and find its inverse. **(OR)**
    b) A relation R is defined on the set z of integers as follows :
    $(x, y) \in R \Leftrightarrow x^2 + y^2 = 25$. Express R and R^{-1} as the set of ordered pairs and hence find their respective domains.
43. a) If x = 1 is one root of the equation $x^3 - 6x^2 + 11x - 6 = 0$, find the other roots. **(OR)**
    b) The Government plans to have a circular zoological park of diameter 8 km. A separate area in the form of a segment formed by a chord of length 4 km is to be alloted exclusively for a veterinary hospital in the park. Find the area of the segment to be allotted for the veterinary hospital.
44. a) Prove that in ΔABC, $a\sin\left(\frac{A}{2}+B\right) = (b+c)\sin\frac{A}{2}$ **(OR)**
    b) Prove that $\cos^2 x + \cos^2\left(x+\frac{\pi}{3}\right) + \cos^2\left(x-\frac{\pi}{3}\right) = \frac{3}{2}$
45. a) Show that $\sin^2\frac{\pi}{18} + \sin^2\frac{\pi}{9} + \sin^2\frac{7\pi}{18} + \sin^2\frac{4\pi}{9} = 2$ **(OR)**
    b) Using the mathematical induction show that for any natural number n $\frac{1}{2.5} + \frac{1}{5.8} + \frac{1}{8.11} + \ldots + \frac{1}{(3n-1)(3n+2)} = \frac{n}{6n+4}$
46. a) Find the sum of all 4 digit numbers, that can be formed by using the digits 1, 2, 4, 6 and 8 **(OR)**
    b) If a and b are distinct integers, prove that a – b is a factor of $a^n - b^n$ whenever n is a positive integer.
47. a) Show that $\frac{(2n)!}{n!} = 2^n [1.3.5...(2n-1)]$ **(OR)**
    b) The 2nd, 3rd and 4th terms in the binomial expansion of $(x+a)^n$ are 240, 720 and 1080 for a suitable value of x. Find x, a and n.