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+1 MODEL EXAMINATION

PART III – MATHEMATICS

[English Version]

Time allowed: 2 ½ Hours] **[Maximum Marks: 90**

PART-A

Note: (i) All questions are compulsory.
(ii) Each question carries one mark.
(iii) Choose the most suitable answer from the given four alternatives. **20 x 1 = 20**

1. If [3 -1 2] B = [5 6] the order of matrix B is
   (1) 3 x 1 (2) 1 x 3 (3) 3 x 2 (4) 1 x1
2. If all the three rows are identical in a determinant Δ on putting x = a then the factor of Δ is
   (1) x – a (2) x + a (3) $(x-a)^2$ (4) $(x+a)^2$
3. In a ΔABC, $\overrightarrow{AB}+\overrightarrow{BC}+\overrightarrow{CA}$ =
   (1) $\overrightarrow{OG}$ (2) $3\overrightarrow{OG}$ (3) $\overrightarrow{AC}$ (4) $\vec{O}$
4. If the initial point of vector $-2\vec{i}-3\vec{j}$ is (-1 , 5 , 8) then the terminal point is
   (1) $3\vec{i}+2\vec{j}+8\vec{k}$ (2) $-3\vec{i}+2\vec{j}+8\vec{k}$ (3) $-3\vec{i}-2\vec{j}-8\vec{k}$ (4) $3\vec{i}+2\vec{j}-8\vec{k}$
5. If $\frac{3x+7}{(x-1)(x-2)}=\frac{13}{x-2}+\frac{B}{x-1}$
   (1) -10 (2) 10 (3) 13 (4) -13
6. If nPr = 720 nCr, then the value of r is
   (1) 6 (2) 5 (3) 4 (4) 7
7. When the terms of a G.P are written in reverse order the progression formed is
   (1) A.P (2) G.P (3) H.P (4) A.P and H.P
8. If $a_n = \cos\left(\frac{n\pi}{2}\right)$ then a_4
   (1) 1 (2) 0 (3) -1 (4) $\frac{\pi}{2}$
9. If the pair of straight lines given by $ax^2+2hxy+by^2 = 0$ is
   (1) ab=0 (2) a + b =0 (3) a-b =0 (4) a =0
10. The centre of the circle $x^2 + y^2 + 2x – 4y – 4 = 0$ is
    (1) (2,4) (2) (1,2) (3) (-1 ,2) (4) (-2 ,-4)
11. Area of triangle ABC is
    (1) $\frac{1}{2}ab\cos C$ (2) $\frac{1}{2}ab\sin C$ (3) $\frac{1}{2}ab\cos C$ (4) $\frac{1}{2}bc\sin C$
12. Convert $\frac{3\pi}{4}$ into degrees.
    (1) 45° (2) 135° (3) 180° (4) 90°
13. The range of the function e^x is
    (1) $(-\infty,\infty)$ (2) [-1 ,1] (3) (0 , ∞) (4) [0 ,1]
14. The value of $\lfloor -.2 \rfloor$ is
    (1) 0 (2) 1 (3) -1 (4) -2

15. The function $f(x)=\dfrac{\sin(x-2)}{x-2}, x\neq 2$ is discontinuous is
$0 \qquad x=2$

(1) X=0 (2) x = -1 (3) x =-2 (4) x =2

16. $\lim\limits_{x\to 0}\dfrac{e^x-1}{x}$

(1) E (2) 0 (3) -1 (4) 1

17. $\int \dfrac{x}{1+x^2}dx$ =

(1) $\tan^{-1}$ x+c (2) $\dfrac{1}{2}\log(1+x^2)+c$ (3) log $(1+x^2)$ + c (4) log x +c

18. $\int e^{3x}\sin 2x\,dx$

(1) $\dfrac{e^{3x}}{13}(3\sin 2x-2\cos 2x)+c$

(2) $\dfrac{e^{3x}}{13}(3\sin 2x+2\cos 2x)+c$

(3) $\dfrac{e^{3x}}{13}(2\sin 2x+3\cos 2x)+c$

(4) $\dfrac{e^{3x}}{13}(2\sin x-3\cos 2x)+c$

19. Three coins are tossed. The probability of getting atleast two heads is

(1) $\dfrac{3}{8}$ (2) $\dfrac{7}{8}$ (3) $\dfrac{1}{8}$ (4) $\dfrac{1}{2}$

20. Given P(A) = 0.50, P(B) = 0.40 and P(A $\cap$ B) =0.20 then P $(A/\overline{B})$ =

(1) 0.50 (2) 0.40 (3) 0.70 (4) 0.10

PART-B

II. Answer any 7 of the following questions:

Question no: 30 is compulsory: **7 x 2 =14**

21. Evaluate : $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$

22. If G is the centroid of a triangle ABC, prove that $\overrightarrow{GA}+\overrightarrow{GB}+\overrightarrow{GC}=\vec{O}$

23. If ${}_9P_r$ = 3024, find r.

24. Find the length of the perpendicular from (2 ,-3) to the line 2x – y + 9 = 0

25. Simplify : sec (- 1305°)

26. Let $f:R\to R$ be a function defined by $f(x)=2x+1$. Find f^{-1}

27. Find the derivative of $x^5+4x^4+7x^3+6x^2+2$ w.r. t x.

28. Evaluate : $\int \sin^2 x\,dx$

29. If an experiment has exactly the three possible mutually exclusive outcomes. A, B and C , check in each case whether the assignment of probability is permissible :

$P(A)=\dfrac{1}{3}, P(B)=\dfrac{1}{3}, P(C)=\dfrac{1}{3}$

30. Show that $\frac{e+e^{-1}}{2}=1+\frac{1}{2!}+\frac{1}{4!}+\ldots\ldots \propto$

PART-C

Note: Answer Any 7 questions of the following:
Question no : 40 is compulsory **7 x 3=21**

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31. If A = $\begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$ find A^2 - 7A - 2I

32. Find the coefficient of x^5 in the expansion of $\left(x-\frac{1}{x}\right)^{11}$

33. The first and second terms of a H.P are $\frac{1}{3}$ and $\frac{1}{5}$ respectively, find the 9^{th} term.

34. The slope of one of the straight lines of $ax^2+2hxy+by^2=0$ is thrice that of the other, show that $3h^2$ =4ab

35. Evaluate : $\cos\left[\sin^{-1}\frac{3}{5}+\sin^{-1}\frac{5}{13}\right]$

36. Let $f:R\to R$ be defined by $f(x)=3x+2$. Find f^{-1} and show that $fof^{-1}=f^{-1}of=I$

37. Differentiate : $\sin^{-1}(3x-4x^3)$

38. Integrate : $(2x-3)\sqrt{4x+1}$

39. A card is drawn at random from a deck of 52 cards. What is the probability that the drawn card is (i) a queen or club card (ii) a queen or a black card.

40. If C is the mid- point of AB and P is any point outside AB,then prove that $\overrightarrow{PA}+\overrightarrow{PB}=2\overrightarrow{PC}$

PART-D

IV. Answer all questions of the following: **7 x 5=35**

41. Prove that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix}=(a+b+c)^3$

(OR)

If ABCD is a quadrilateral and E and F are the mid-points of AC and BD respectively, prove that $\overrightarrow{AB}+\overrightarrow{AD}+\overrightarrow{CB}+\overrightarrow{CD}=4\overrightarrow{EF}$

42. If A + B = 45°, show that (cot A-1) (cot B-1) =2 and deduce the value of cot $22\frac{1}{2}^{\circ}$

(OR)

State and prove Napiers Formula.

43. Prove by Mathematical induction : $1^2+2^2+3^2+\ldots\ldots+n^2=\frac{n(n+1)(2n+1)}{6}$ for all n∈N.

(OR)

If a, b are two different positive numbers then prove that

(i) A.M., G.M., H.M are in G.P (ii) A.M > G.M > H.M

44. Find the co-ordinates of orthocentre of the triangle whose vertices are the points(3,2),(-4,1)and (-5,8)

(OR)

Find the equation the circle passing through the points (0 ,1), (2,3) and (-2 ,5)

45. For $\left|\frac{\Delta x}{a}\right| < 1$ and for any rational index *n*. Prove that $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1} (a \neq 0)$

(OR)

If y=sin(sinx),Prove that $y_2 + y_1 tanx + ycos^2 x = 0$

46. Integrate : $\frac{4x-3}{x^2+3x+8}$

(OR)

Evaluate: $\int_1^2 (2x+5)dx$

47. If $x \in R$, prove that the range of the function $f(x) = \frac{x^2-3x+4}{x^2+3x+4}$ $is\left[\frac{1}{7}, 7\right]$

(OR)

A factory has two Machines-I and II. Machine –I produces 25% of items and Machine-II produces 75% of the items of the total output. Further 3% of the items produced by Machine –I are defective whereas 4% produced by Machine –II are defective. If an item is drawn at random what is the probability that it is defective?

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