B.S. ABDUR RAHMAN UNIVERSITY, CHENNAI 600 048

DEPARTMENT OF MATHEMATICS & AS

Ph.D. Entrance Examinations – June 2016

Name		**Application Number**	

Answer all the questions (Tick the appropriate answer in the answer sheet)

1 In the sequence $a, b, c, d,$ 0,1,1,2,3,5,8 each term is the sum of the two terms to its left. Find a

a) -3 b) -1 c) 0 d) 1

2 Which of the following equations have the same graph?

I.$y = x - 2$ II. $y = \frac{x^2+4}{X-2}$ III. $(x+2)y = x^2 + 4$

a) I and II only b) I and III only c) II and III only d) None(All the equations have different graph)

3 A sequence is defined by the recurrence relation $u_{n+1} = 3u_n - 4, u_0 = -1$ .What is the value of u_2?

a) -25 b) - 10 c) - 4 d) -1

4 Manoj starts from point P and walks towards south and stops at point Q. He now takes a right turn and then a left turn and stops at R. He finally takes a left turn and stops at S. If he walks 5Km before taking each turn, towards which direction will Manoj have to walk from point S to reach point Q.

a)Northeast b) North c) South d) East

5 If $cos32^\circ = m$ and $cosx = 2m^2 = 1$; α, β are the values of x between $0^\circ and\ 360^\circ$then

a) $\alpha + \beta = 180^\circ$ b) $\beta - \alpha = 200^\circ$

c) $\beta = 4\alpha + 40^\circ$ d) $\beta = 5\alpha - 20^\circ$

6 If $log_3 t = 2 + log_3$, what is the value of t?

a) 7 b) 25 c) 10 d) 45

7 Functions f and g are given by $f(x) = 2x - 3$ and $g(x) = x^2$. Find an expression for $g(f(x))$.

a) $g(f(x)) = 4x^2 - 12x + 9$ b) $g(f(x)) = x^2 + 2x - 3$

c) $g(f(x)) = 4x - 9$ d) $g(f(x)) = 2x^3 - 3x^2$

8 The number of real solution to the equation $\frac{x}{100} = sinx$ is

a)61 b) 62 c) 63 d) 64

9 The result "let (-1,1) be interval of convergence for the power series $\sum_{n=0}^{\infty} a_n x^n$. If $\sum_{n=0}^{\infty} a_n = S$, then $\lim_{x\to 1-0} \sum_{n=0}^{\infty} a_n x^n = S^n$ is known as

a) uniqueness theorem b) weierstrass's theorem

c)Tauber's theorem d) Abel's theorem

10 The function $D: R \to R$ such that $D(x) = \begin{cases} 1, & if\ x \in Q \\ 0, & if\ x \notin Q \end{cases}$ is known as

a) step function b) simple function

c) characteristics function d) dirichlets function

11 15% of 1080 is

a) 161.20 b) 162 c) 322.40 d) 3224

12 0.35% expressed as a decimal, is equal to

a) 0.35 b) 0.035 c) 0.0035 d) 3.5

13 For $0 \le p \le 1$ the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{n^p}$ is

a) convergent but not absolute b) convergent

c) absolutely convergent d) oscillatory

14 In terms of powers of prime numbers, 1260 can be written as

$a) 2^2 \times 3 \times 5^2$ b) $2^2 \times 3^2 \times 5 \times 7$ c) $2 \times 3^2 \times 5^2 \times 7$ d) $3 \times 2^2 \times 7^2 \times 5$

15 Suppose hops, skips, and jumps are specific units of length. If b hops equals c skips, d jumps equals e hops, and f jumps equals g meters, then one meter equals how many skips?

$a) \frac{bdg}{cef}$ b) $\frac{cdf}{beg}$ c) $\frac{cdg}{bef}$ d) $\frac{cef}{bdg}$

16 A calculator has a key which replaces the displayed entry with its square, and another key which replaces the displayed entry with its reciprocal. Let y be the final result if one starts with an entry$x \neq 0$ and alternately squares and reciprocates n times. Assuming the calculator is completely accurate (e.g. no roundoff or overflow) then y equals

$a) x^{((-2)^n)}$ b) x^{2n} c) x^{-2n} d) $x^{-(2^n)}$

17 The following four statements, and only these are found on a card:

On this card exactly one statement is false.

On this card exactly two statements are false.

On this card exactly three statements are false.

On this card exactly four statements are false.

Assume each statement is either true or false. Among them the number o false statements is exactly

a)0 b) 1 c) 2 d) 3

18 The product of (2 x – 3) and (2 x + 3) is :

a)$2x^{\,2} - 3$ b) $4x^{\,2} - 3$ c) $4x^{\,2} - 9$ d) $4x^{\,2} + 9$

19 In Fig. 2, if $\angle BPQ$ = 36°, then y equals

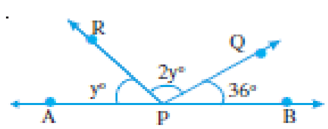

Fig. 2

a) 36° b) 72° c) 46° d) 48°

20 In Fig. 1, ABC is a triangle in which

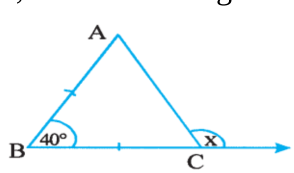

Fig. 1

AB = BC and $\angle B$ = 40°, then x equals :

a) 110°b) 120° c) 140° d) 70°

21 A two digit number is such that the product of its digits is 12. When 36 is added to the number, the digits interchange their places. Find the number.

a) 27 b)28 c) 14 d)26

22 Find the radius of a sphere whose surface area is 616 cm^2.

a) 7 b) 3 c) 4 d) 8

23 The value of tan 1°. tan 89° is :

a) $\frac{1}{2}$ b) $\frac{3}{2}$ c)1 d) $\frac{1}{\sqrt{3}}$

24 In what time will Rs. 2700 yield the same simple interest at 4% per annum as Rs. 2250 in 4 years at 3% per annum?

a) $2\frac{1}{2}$ b) $2\frac{3}{2}$ c) 2 d) $4\frac{1}{3}$

25 Find the median of the data, 2, 1, 5, 7, 1.

1 b) 2 c) 1.5 d) 2.5

26 In a frequency distribution, the class mark of a class is 10 and its width is 5. The lower limit of class is

a) 5 b) 7.5 c) 10 d) 12.5

27 If $sin\theta = \frac{a}{b}$ then $cos\theta$ equals:

a). $\frac{\sqrt{b^2-a^2}}{b}$ b). $\frac{\sqrt{a^2-b^2}}{b}$ c). $\frac{b}{\sqrt{b^2-a^2}}$ d). $\frac{1}{\sqrt{3}}$

28 Evaluate: Cos 43°. Cot 79° – Sin 47°. tan 11°

a) 1 b) 0 c) 2 d) infinity

29 If the digit of the number 26839514 are arranged in descending order, the position of how many digits will remain unchanged

a) Two b) four c) none d) three

30 In a row of twenty students, R is fifth from the right end and T is fourth from the left end. How many students are there between R and T in the row?

a) 11 b) 10 c) 13 d) 12

31 M/M/3/N, queue description states the number of servers and buffer capacity as

a) 3 and M b) M and 3 c) 3 and N d) None of these

32 There are N inventories in the system, one by one all the inventories are consumed with replacing the inventories. This process is stated as

a) The pure death process b) The pure birth process

c) The birth-death process d) none of these

33 Every distributive lattice is

a) Modular b) lattice c) distributive lattice d) isotonity

34 If ‘n’ is an integer and 3n + 2 is odd then ‘n’ is

a) odd b) even c) either odd or even d) neither even nor odd

35 If the primal has unbounded solution then the dual has

a) Infeasible solution b) no solution c) many solution d) infinite solution

36 A constraint of ≤ type is changed to equality by adding a

a) Slack variable b) surplus variable c) basic variable d) non basic variable

37 The set of all feasible solutions to an LPP is a

a) Convex set b) concave set c) degeneracy set d) non degeneracy set

38 What is the minimum number of students required in a discrete mathematics class to be sure that at least six will receive the same grade, if there are five possible grades, A, B, C, D and F?
a) 26 b) 36 c) 20 d) 16

39 Every subgroup of a cyclic group is
a) Cyclic b) subgroup c) abelian group d) normal subgroup

40 A simple graph is connected iff it has
a) Spanning tree b) tree c) circuit d) square

41 The statement "The nest arrival of a customer is independent of previous arrival of customer" stated as
a) Memory less property b) Memorable property c) storage property d) None of these

42 Under the exponential assumption the probability that an event occur in sufficient small interval is
a) greater than one b) less than one c) equal to one d) None of these

43 In the EOQ model
a) Order arrive in a batch b) Demand is known and occurs at a constant rate
c) All demand must be satisfied d) All of the above

44 Under Memory less property assumption, the arrival of the customer is independent of
a) Previous arrival b) Future arrival c) State of arrival d) None of these

45 A manufacturer has to supply 12000 units of a product per year to his customer. Shortages are not permitted and there is no lead time. The inventory holding cost is Rs. 0.20 per unit per month and the setup cost per run is Rs. 350. The economic lot size is
a) 1870 b) 1860 c) 1890 d) 1880

46 In a carwash station cars arrive for service according to Poisson distribution, with mean 4 per hr. The average service time of a car is 10 min. The probability that an arriving car has to wait is
a) 2/3 b) 1/3 c) 4/6 d) ½

47 All of the following may be used to find the EOQ except
a)Optimal number of days supply to order
b)Number of orders which minimize ordering costs
c) Optimal number of rupees per order
d) optimal number of orders per year

48 The mean and variance of the poisson distribution are
a) equal b) mean>variance c) mean<variance d) None of these

49 For M/M/1 model the expected number of busy servers are equal to
a) Traffic intensity ρ b) Arrival rate λ c) Service rate μ d) None of these

50 In queuing description M/M/1 the arrival and departure distribution are
a) Both Markovian b) Binomial c) General d) None of these

51 Laplace transform of tant doesn't exist because
a) It has finite number of discontinuous points

b) It has finite number of continuous points

c) It has an infinite number of continuous points

d) It has an infinite number of discontinuous points

52 The complementary function of x^2 y" – 2xy' + 2y = 0 is

a) A + Bx b) Ax + Bx^2 c) Ax^2 + Bx + C d) Ax + B

53 If H_1 & H_2 are subgroups of a group G then $H_1.H_2 = \{h_1h_2 \epsilon G \backslash h_1 \epsilon H_1, h_2 \epsilon H_2\}$is a subgroup of G.

a)True b) false c) Not a subgroup d) none of the above

54 The following inequality is correct

a) P(A∩B)≤ P(A)+P(B) b) P(A∩B)≥P(A)+P(B)

c) P(A∩ B)=O d) P(A∩B)=P(A)+P(B)

55 If A and B are independent events then

a) P(A/B)=P(A).P(B) b) P(A/B)=P(B) c) P(A/B)=P(A) d) None of these

56 The cost matrix in a assignment problem is a

a) Square matrix b) Rectangle matrix c) Diagonal matrix d) None of these

57 'A 'can hit a target in 4 out of 5 shots and 'B' can hit the target in 5 out of 6 shots. The target being hit when both try is

a) 29/30 b) 9/30 c) 12/30 d) 7/30

58 The probability distribution function always satisfies the probability postulates

a) Always true b) Partially true c) Always false d) Partially false

59 If n is not a multiple of 23 then the remainder when n^{11} is divided by23$\pm$is 1(mod 23)

a)True b) false c) statement is incorrect d) none of the above

60 The probability of occurrence of any event

a) more than 1 b) more than 0 c) less than 1 d) 0 and less than or equal to 1

61 The mobius transform takes

a) Circle in to line b) Circle to Circle c) Circle into square d) None of these

62 Bender Smidth formula is valid only when

a) $k = \frac{a}{2}h^2$ b) $h = \frac{a}{2}k^2$ c) $k = \frac{h}{2}a^2$ d) $k = \frac{a}{2}h$

63 In the definition of Fourier transform $F(s) = \frac{1}{\sqrt{2\pi}}\int_0^\infty f(x)\, e^{isx}\, dx$, the kernel is

a) $f(x)e^{isx}$ b) e^{isx} c) $\frac{1}{\sqrt{2\pi}}e^{isx}$ d) $\frac{1}{\sqrt{2\pi}}$

64 Numerical solution of first order differential equation using Milne predictor Corrector formula requires……prior values of the dependent variable

a) 5 b) 4 c) 3 d) 1

65 The Simpsons three eighth rule is applicable if

a) number of subintervals must be even

b) number of subintervals must be odd

c) number of subintervals is a multiples of 3

d) number of subintervals is a multiples 8

66 Criterion for the convergence in Newton Raphson method is

a) $|f(x)\ f^{1}(x)| \le |\ f^{11}(x)\ |$ b) $|f(x)\ f^{11}(x)| \le |\ f^{1}(x)\ |$

c) $|f(x)\ f^{11}(x)| \le |f^{1}(x)|^{2}$ d) $|f(x)\ f^{1}(x)| \le |\ f^{11}(x)^{2}\ |$

67 Fourier sine transform of 1 / x is

a) $\sqrt{\frac{\pi}{2}}$ b) $\frac{\pi}{2}$ c) $\sqrt{\frac{2}{\pi}}$ d) $\sqrt{\frac{2}{\pi}}$

68 The transformation for evaluating the definite integral $\int_a^b f(x)\ dx$ using Gauss Quadrature formula is

a) $x = \left(\frac{b-a}{2}\right) t + \left(\frac{b+a}{2}\right)$ b) $x = \left(\frac{b+a}{2}\right) t + \left(\frac{b-a}{2}\right)$

c) $x = \left(\frac{a-b}{2}\right) t + \left(\frac{a+b}{2}\right)$ d) $x = \left(\frac{b-a}{2}\right) + \left(\frac{b+a}{2}\right)$t

69 $L^{-1}\left[\frac{e^{-s}}{s}\right]$=…….. (u(t) = unit step function)

a) u (t-1) b) u (t-2) c) u (t+1) d)u(t+2)

70 $L\left[t^{\frac{1}{2}}\right] = ...$ a) $\frac{\sqrt{\pi}}{2s^{\frac{3}{2}}}$ b) $\frac{\sqrt{\pi}}{3s^{\frac{3}{2}}}$ c) $\frac{\sqrt{\pi}}{2s^{\frac{2}{3}}}$ d) $\frac{\sqrt{\pi}}{2s^{\frac{1}{2}}}$

71 Every basic feasible solution in convex set of solution is

a) Extreme point b) Boundary Point c) Non- extreme point d) Non- boundary point

72 If I is a ideal in a ring then

a) R/I is a ring b) RI is a ring c) R+I is a ring d) R-I is a ring

73 If G is an open set then curve γ is homologous to zero if for all w$w \epsilon \mathbb{C} - G -$

a) $n(\gamma: w) = 0$ b) $n(\gamma: w) = 1$ c) $n(\gamma: w) = 2$ d) $n(\gamma: w) = 4$

74 If R is an integral domain with unit element, then

a) R[x] is not a commutative Ring b) R[x] has a unit element

c) Any unit in R[x] is unit in R d) any unit in R[x] is not an unit in R

75 A branch of logarithmic function is

a) Continuous function b) Differential function

c) Analytic function d) none of these

76 If F is a bounded entire function, then F is

a) Constant b) f is zero

c) f is an increasing function d) f is an decreasing function

77 An analytic function is

a) Infinitely differentiable b) finitely differentiable

c) Not differentiable d) none of these

78 Which of the following is false?

a) F[x] is an integral domain b) F[x] is Euclidean ring

c) F[x] is a Principal ideal ring d) F[x] is not a group

79 A function $f(z+c) = f(z)$, where c is any number, then f is

a) A periodic function b) periodic function with period c

c) Periodic function with period z d) none of these

80 If f is analytic and $f'(z) \neq 0$, then

a) f is non conformal mapping b) f is conformal mapping e

c) f is non constant function d) None of these

81 The volume of a parallelepiped whose edges are represented by

[illegible] is 546. What is the value of a?

a) –1 b) 10 c) -3 d) 23

82 If $|\vec{a}| = 13$, $|\vec{b}| = 5$, $\vec{a}.\vec{b} = 60$ find the value of $|\vec{a} \times \vec{b}|$

a) 9 b) 1 c) 13 d) 25

83 In linear ode, and the dependent variable and its differential coefficients are not multiplied together and occurs only in

a) First degree b) Second degree c) Third degree d) Fourth degree

84 In AX = 0 if $|A| = 0$ then the solution is

a) trivial b) non trivial c) infinite d) no solution

85 The equation $ydx + xdy$ is

a) Exact differential equation b) Not –exact equation

c) Partial differential equation d) None of these

86 The value of Wronskion W(x, x^2 ,x^3) is

a) 2 x^4 b) 2 x^2 c) 2 x^3 d) None of these

87 The n^{th} order ordinary linear homogenous differential equation contains

a) n-singular solutions (b) No singular solution,(c)One singular solution d)None of these

88 What is the value of X if the points (3, 2, -4), (9, 8, -10) and (X, 4, -6) are collinear ?

a) 1 b) -3 c) 5 d) 0

89 Singular solution of differential equation contains

1) Arbitrary constant 2) Can be obtained from general solution 3) Does not contain any arbitrary constants 4) Cannot be obtained from general solution

a) 1, 2 are true b) 3, 4 are true c) the 1, 4 are true d) 2, 4 are true

90 The complete solution of differential equation, contains arbitrary constants

a) More than the order of equation b) can't say c) Equal to order of equation d) less than the order of equation

91 The random variables X and Y are independent whose joint density is $f(x,y) = xye^{-xy}$ $0 < x, y < \infty$, then f(x) is

a) $\int_{-\infty}^{\infty} xy \; e^{-xy} dy$ b) $\int_{0}^{\infty} xy \; e^{-xy} dy$ c) $\int_{x}^{\infty} xy \; e^{-xy} dy$ d) $\int_{y}^{\infty} xy \; e^{-xy} dy$

92 Two Eigen values of $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ are 2 and 8. Find the 3rd Eigen value

a) 1 b) 2 c) 4 d) 5

93 The coefficient of x^3 in the expression of $(1+x)^3(2+x^2)^{10}$ is

a) 2^{14} b) 3^{14} c) $\binom{3}{3}+\binom{10}{1}$ d) $\binom{3}{3}+2\binom{10}{1}$

94 $X_1^T X_2 = 0$ then the Eigen vectors X_1 and X_2 are

a) orthogonal b) null c) symmetric d) skew symmetric

95 Given that A = $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ Evaluate $A^3 - 6A^2 + 11A - 10I$

a) null matrix b) identity matrix c) -4I d) 4I

96 If X and Y are independent then cov(ax+b , cy+d)

a). ab cov(x , y) b) cov(ax+b) , cov(cy+d)

c) cov(a+b, c+d) d) cov(ax+b).cov (cy+d)

97 If X is a r.v then var(ax + b) is

a) var(ax) + var(b) b) a^2var(x) +b c) a^2Var(x) d) var(ax) .var(b)

98 The Eigen values of A are 3, 2, 5. What is the sum of Eigen values of A^2

a) 37 b) 39 c) 36 d) 38

99 $\nabla^2 r^n = ?$

a) $n(n+1)r^{n-2}$ b) $(n+1)r^{n-2}$ c) $r^n / n!$ d) $(n-1)r^{n+2}$

100 According to Gauss Divergence theorem

a) $\iiint_v \nabla.\vec{F}\, dV = \iint_s \vec{F}.\hat{n}\, dS$ b) $\iint_s (\nabla\times\vec{F}).\hat{n}\, dS = \int_c \vec{F}.d\vec{r}$ c) $\int_c \vec{F}.d\vec{r} = 0$ d) $\int_c \vec{F}\times d\vec{r} = 0$

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Answer Sheet (Tick the appropriate answer inside the box)

1	a	b	c	d	26	a	b	c	d
2	a	b	c	d	27	a	b	c	d
3	a	b	c	d	28	a	b	c	d
4	a	b	c	d	29	a	b	c	d
5	a	b	c	d	30	a	b	c	d
6	a	b	c	d	31	a	b	c	d
7	a	b	c	d	32	a	b	c	d
8	a	b	c	d	33	a	b	c	d
9	a	b	c	d	34	a	b	c	d
10	a	b	c	d	35	a	b	c	d
11	a	b	c	d	36	a	b	c	d
12	a	b	c	d	37	a	b	c	d
13	a	b	c	d	38	a	b	c	d
14	a	b	c	d	39	a	b	c	d
15	a	b	c	d	40	a	b	c	d
16	a	b	c	d	41	a	b	c	d
17	a	b	c	d	42	a	b	c	d
18	a	b	c	d	43	a	b	c	d
19	a	b	c	d	44	a	b	c	d
20	a	b	c	d	45	a	b	c	d
21	a	b	c	d	46	a	b	c	d
22	a	b	c	d	47	a	b	c	d
23	a	b	c	d	48	a	b	c	d
24	a	b	c	d	49	a	b	c	d
25	a	b	c	d	50	a	b	c	d

51	a	b	c	d	76	a	b	c	d
52	a	b	c	d	77	a	b	c	d
53	a	b	c	d	78	a	b	c	d
54	a	b	c	d	79	a	b	c	d
55	a	b	c	d	80	a	b	c	d
56	a	b	c	d	81	a	b	c	d
57	a	b	c	d	82	a	b	c	d
58	a	b	c	d	83	a	b	c	d
59	a	b	c	d	84	a	b	c	d
60	a	b	c	d	85	a	b	c	d
61	a	b	c	d	86	a	b	c	d
62	a	b	c	d	87	a	b	c	d
63	a	b	c	d	88	a	b	c	d
64	a	b	c	d	89	a	b	c	d
65	a	b	c	d	90	a	b	c	d
66	a	b	c	d	91	a	b	c	d
67	a	b	c	d	92	a	b	c	d
68	a	b	c	d	93	a	b	c	d
69	a	b	c	d	94	a	b	c	d
70	a	b	c	d	95	a	b	c	d
71	a	b	c	d	96	a	b	c	d
72	a	b	c	d	97	a	b	c	d
73	a	b	c	d	98	a	b	c	d
74	a	b	c	d	99	a	b	c	d
75	a	b	c	d	100	a	b	c	d