

NO.1 INSTITUTE FOR IAS/IFoS EXAMINATIONS



MATHEMATICS CLASSROOM TEST

2020-21

Under the guidance of K. Venkanna

MATHEMATICS

ODE CLASS TEST

Date: 23 June-2020

Timing : 2:00 PM to 5:00 PM

Time: 03:00 Hours

Maximum Marks: 250

INSTRUCTIONS

1. Write your details in the appropriate space provided on the right side.
2. Answer must be written in the medium specified in the admission Certificate issued to you, which must be stated clearly on the right side. No marks will be given for the answers written in a medium other than that specified in the Admission Certificate.
3. Candidates should attempt All Question.
4. The number of marks carried by each question is indicated at the end of the question. Assume suitable data if considered necessary and indicate the same clearly.
5. Symbols/notations carry their usual meanings, unless otherwise indicated.
6. All answers must be written in blue/black ink only. Sketch pen, pencil or ink of any other colour should not be used.
7. All rough work should be done in the space provided and scored out finally.
8. The candidate should respect the instructions given by the invigilator.
9. The question paper-cum-answer booklet must be returned in its entirety to the invigilator before leaving the examination hall. Do not remove any page from this booklet.

**READ INSTRUCTIONS ON THE
LEFT SIDE OF THIS PAGE
CAREFULLY**

Name

Mobile No.

Email.: (In Block Letter)

Test Centre

Medium

I have read all the instructions and shall abide by them

Signature of the Candidate

I have verified the information filled by the candidate above

Signature of the invigilator

INDEX TABLE

| Question | Page No. | Max. Marks | Marks Obtained |
|----------|----------|------------|----------------|
| 1. | | 20 | |
| 2. | | 15 | |
| 3. | | 10 | |
| 4. | | 16 | |
| 5. | | 10 | |
| 6. | | 10 | |
| 7. | | 20 | |
| 8. | | 15 | |
| 9. | | 12 | |
| 10. | | 15 | |
| 11. | | 15 | |
| 12. | | 10 | |
| 13. | | 10 | |
| 14. | | 12 | |
| 15. | | 15 | |
| 16. | | 14 | |
| 17. | | 15 | |
| 18. | | 16 | |

Total Marks

1. (i) Solve $(2x^2 + 3y^2 - 7)xdx - (3x^2 + 2y^2 - 8)y dy = 0$.
- (ii) Solve $(2xy^4 e^y + 2xy^3 + y)dx + (x^2 y^4 e^y - x^2 y^2 - 3x)dy = 0$.
- (iii) If $L^{-1} \left\{ \frac{p}{(p^2 + 1)^2} \right\} = \frac{1}{2} t \sin t$, find $L^{-1} \left\{ \frac{32p}{(16p^2 + 1)^2} \right\}$ [20]

2. Use the method of variation of parameters to solve $y'' + y = 1 / (1 + \sin x)$. [15]

3. Find the general and singular solution of $y^2 (y - xp) = x^4 p^2$. [10]

4. Reduce the equation $x^2y'' - 2x(1 + x)y' + 2(1 + x)y = x^3$, ($x > 0$) into the normal form and hence solve it. [16]

5. Solve $(x^2 + y^2)(1 + p)^2 - 2(x + y)(1 + p)(x + yp) + (x + yp)^2 = 0$ [10]

6. (i) If $L^{-1} \left\{ \frac{e^{-1/p}}{p^{1/2}} \right\} = \frac{\cos 2\sqrt{t}}{\sqrt{(\pi t)}}$, find $L^{-1} \left\{ \frac{e^{-a/p}}{p^{1/2}} \right\}$ where $a > 0$.

(ii) Find $L^{-1} \left\{ \log \left(1 + \frac{1}{p^2} \right) \right\}$.

[10]

7. (i) Use the method of variation of parameters to find the general solution of $x^2y'' - 4xy' + 6y = -x^4 \sin x$.
- (ii) Solve $x^2(d^3 y / dx^3) + 2x(d^2 y / dx^2) + 2(y / x) = 10\left(1 + \frac{1}{x^2}\right)$. **(10 + 10 = 20)**

8. Solve $(px^2 + y^2)(px + y) = (p + 1)^2$ by reducing it to Clairaut's form and find its singular solution. **[15]**

9. (i) Solve $x(1 - x^2) dy + (2x^2y - y)dx = ax^3dx$.
(ii) Solve $(xy^2 + 2x^2y^3) dx + (x^2y - x^3y^2) dy = 0$.

[12]

10. By using Laplace transformation solve $(D^2 + m^2)x = a \sin nt$, $t > 0$, where x , Dx equal to x_0 and x_1 , when $t = 0$, $n \neq m$. [15]

11. Solve the initial value problem

$$\frac{d^2 y}{dt^2} + y = 8e^{-2t} \sin t, y(0)=0, y'(0)=0 \text{ by using Laplace-transform}$$

[15]

12. (i) Find $L^{-1} \left\{ \log \frac{p+3}{p+2} \right\}$

(ii) Prove that $L \left\{ \frac{\cos at - \cos bt}{t} \right\} = \frac{1}{2} \log \frac{s^2 + b^2}{s^2 + a^2}$ [10]

13. Show graphically that $y_1(x) = x^2$ and $y_2(x) = x|x|$ are linearly independent on $-\infty < x < \infty$, however Wronskian vanishes for every real value of x . [10]

14. Find the orthogonal trajectories of the family of curve

$$\frac{x^2}{a^2} + \frac{y^2}{a^2 + \lambda} = 1, \lambda \text{ being the parameter.}$$

[12]

15. Solve $x^2 \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} + y = \frac{\log x \sin \log x + 1}{x}$. [15]

16. (i) Find the orthogonal trajectories of $r = a (1 + \cos n\theta)$.

(ii) Solve $\frac{dy}{dx} + \frac{y}{(1-x^2)^{3/2}} = \frac{x + \sqrt{1-x^2}}{(1-x^2)^2}$. [14]

17. Solve $(D^4 + D^2 + 1)y = e^{-x/2} \cos(x\sqrt{3}/2)$. [15]

- 18.** (i) The number of bacteria in a yeast culture grows at a rate which is proportional to the number present. If the population of a colony of yeast bacteria triples in 1 hour, find the number of bacteria which will be present at the end of 5 hours.
- (ii) Solve $(D^2 + 1)y = x^2 \sin 2x$. **[16]**

ROUGH SPACE

INDIA'S No. 1 INSTITUTE FOR IAS/IFoS EXAMINATIONS



OUR ACHIEVEMENTS IN IFoS (FROM 2008 TO 2018)

OUR RANKERS AMONG TOP 10 IN IFoS



PRATAP SINGH
AIR-01
IFoS-2016



PRATEEK JAIN
AIR-03
IFoS-2016



SIDHARTHA GUPTA
AIR-03
IFoS-2014



VARUN GUNTUPALLI
AIR-04
IFoS-2014



TESWANG GYALTSON
AIR-04
IFoS-2010



DESHAL DAN
AIR-05
IFoS-2017



PARTH JAISWAL
AIR-05
IFoS-2014



HIMANSHU GUPTA
AIR-05
IFoS-2011



ASHISH REDDY MV
AIR-06
IFoS-2015



ANUPAM SHUKLA
AIR-07
IFoS-2012



AANCHAL SRIVASTAVA
AIR-09
IFoS-2018



HARSHVARDHAN
AIR-10
IFoS-2017



SAURABH KUAMR
AIR-16
IFoS-2018



CHINTAN DOBARIYA
AIR-29
IFoS-2018



P.V.S. REDDY
AIR-22
IFoS-2017



PRAKASH GUPTA
AIR-23
IFoS-2017



SUNNY K. SINGH
AIR-24
IFoS-2017



SITANSHU PANDEY
AIR-25
IFoS-2017



G. ROHITH
AIR-35
IFoS-2017



SUNEEL SHEORAN
AIR-36
IFoS-2017



VASU DODGAR
AIR-40
IFoS-2017



SACHIN GUPTA
AIR-45
IFoS-2017



ANKIT KUMAR
AIR-51
IFoS-2017



RUSHAL GARG
AIR-58
IFoS-2017



RAHUL K. JADHAV
AIR-68
IFoS-2017



PRINCE KUMAR
AIR-80
IFoS-2017



DHARMVEER DAIRU
AIR-93
IFoS-2017



NAVDEEP AGGARWAL
AIR-21
IFoS-2015



PRAVEEN VERMA
AIR-22
IFoS-2015



SAURABH
AIR-23
IFoS-2016



DIPESH MALHOTRA
AIR-30
IFoS-2016



MANISH K. S.
AIR-31
IFoS-2016



ASHUTOSH SINGH
AIR-32
IFoS-2016



RAJAT KUMAR
AIR-35
IFoS-2016



PIYUSH B.
AIR-36
IFoS-2016



RAVISH JAIN
AIR-48
IFoS-2016



RAHUL SHINDE
AIR-57
IFoS-2016



RAHUL KUMAR
AIR-58
IFoS-2016



SANGEETA MAHALA
AIR-68
IFoS-2016



PUNEET SONKAR
AIR-98
IFoS-2016



HIMANSHU P.
AIR-108
IFoS-2016



SIDHARTHA JAIN
AIR-13
IFoS-2015



AKSHAY GODARA
AIR-15
IFoS-2015



MANISHA RANA
AIR-19
IFoS-2015



RAJEEV BAKHANI
AIR-29
IFoS-2015



VIJAY SHANKAR P.
AIR-30
IFoS-2015



MD. ADIL ASHRAF
AIR-48
IFoS-2015



MAHATIM YADAV
AIR-62
IFoS-2015



KUNAL DODAWAT
AIR-67
IFoS-2015



RAJ KUMAR
AIR-72
IFoS-2015



SUMIT KUMAR
AIR-74
IFoS-2015



NITHAN RAJ TN
AIR-78
IFoS-2015



HIMANSHU BAGRI
AIR-87
IFoS-2015



KHAGESH PEGU
AIR-93
IFoS-2015



AMNEET SINGH
AIR-101
IFoS-2015



K.Y. VIJAY
AIR-13
IFoS-2014



AMIT CHAUDHRI
AIR-14
IFoS-2014



A.K. SRIVASTAVA
AIR-18
IFoS-2014



SURYA KANT PAWAR
AIR-48
IFoS-2014



SUPIN KUMAR
AIR-57
IFoS-2014



KULRAJ SINGH
AIR-16
IFoS-2013



MOHIT GUPTA
AIR-29
IFoS-2013



NITISH KUMAR
AIR-39
IFoS-2013



NAVIN P. SHETTY
AIR-72
IFoS-2013



ABDUL DAYIM
AIR-32
IFoS-2012



DILIP K. YADAV
AIR-48
IFoS-2012



RAJESH KUMAR
AIR-72
IFoS-2012



TIRUMALA SANKARAN
AIR-11
IFoS-2011



JAI YADAV
AIR-36
IFoS-2010



VIJAYA RASTRI
AIR-80
IFoS-2010



SHASHANK KUMAR
AIR-23
IFoS-2009



SUSHREE KUMAR
UP-PCS
2011
























































































































































**ONLY IMS PROVIDES SCIENTIFIC & INNOVATIVE TEACHING
METHODOLOGIES FULLY REVISED STUDY MATERIALS AND FULLY REVISED TEST SERIES.**

HEAD OFFICE: 25/8, Old Rajender Nagar, Delhi-60. BRANCH OFFICE: 105-106, Top Floor, Mukherjee Tower Mukherjee Nagar, Delhi-9

☎ Ph.: 011-45629987, 9999197625 🌐 www.ims4maths.com @ e-Mail: ims4maths@gmail.com

Regional Office: H.No. 1-10-237, 2nd Floor, Room No. 202 R.K'S-Kancham's Blue Sapphire Ashok Nagar, Hyderabad-20. Ph.: 9652351152, 9652661152

OUR ACHIEVEMENTS IN IAS (FROM 2008 TO 2018)

| | | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|  KANISHK KATARIA AIR-01 (2018) |  K. VARUN REDDY AIR-07 (2018) |  TANMAY V. SHARMA AIR-10 (2018) |  G.S. PRAJESH CHANDRA AIR-64 (2018) |  MANISHA RANA AIR-67 (2018) |  DALIP KUMAR AIR-73 (2018) |  KHUSHBOO GUPTA AIR-80 (2018) |  JAY SHIVANI AIR-81 (2018) |  ANCHAL SRIVASTAVA AIR-110 (2018) |  RAUSHAN KUMAR AIR-114 (2018) |  HIMANSHU PRAJAPATI AIR-124 (2018) |  AVDRESH DIXIT AIR-158 (2018) |  SUNEEL SHEORAN AIR-192 (2018) | |
|  AKASH SINGH AIR-193 (2018) |  ARCHITA V. CHANDAK AIR-206 (2018) |  AVINASH C. SANDILYA AIR-215 (2018) |  SACHIN BANSAL AIR-348 (2018) |  KATTA RAVI TEJA AIR-349 (2018) |  S. GAUTAM RAJ AIR-353 (2018) |  RAJAT BHARGAVA AIR-366 (2018) |  C. VISHNU CHARAN AIR-406 (2017) |  PANKAJ KUMAWAT AIR-443 (2018) |  SANJAY SAHU AIR-526 (2018) |  KUMAR ASHISH AIR-536 (2018) |  SHURUTI KAMBOJ AIR-586 (2018) |  AYUSH KUMAR AIR-598 (2018) |  AMIT KUMAWAT AIR-600 (2018) |
|  ATUL PRAKASH AIR-04 (2017) |  ANUBHAV SINGH AIR-08 (2017) |  SAGAR KUMAR AIR-13 (2017) |  DESHAL DAN AIR-82 (2017) |  PRATEEK JAIN AIR-86 (2017) |  SUNNY K SINGH AIR-91 (2017) |  RAHUL SINDHE AIR-95 (2017) |  MANISH K.R.S. AIR-138 (2017) |  RAM PRAKASH AIR-162 (2017) |  ARCHIT CHANDAK AIR-184 (2017) |  HARSHAVARDAN AIR-213 (2017) |  MAYANK MANISH AIR-214 (2017) |  K. VARUN REDDY AIR-225 (2017) |  SAURABH B. AIR-235 (2017) |
|  SUNEEL S. AIR-250 (2017) |  NIKHIL BANSAL AIR-255 (2017) |  AVINASH C. S. AIR-291 (2017) |  PRAJESH CHANDRA AIR-512 (2017) |  DALIP KUMAR AIR-609 (2017) |  PRINCE KUMAR AIR-772 (2017) |  UTSAV KAUSHAL AIR-14 (2016) |  MANISH GURWANI AIR-18 (2016) |  AKSHAY GODARA AIR-40 (2016) |  SWAPNIL KHARE AIR-43 (2016) |  VIKALP BHARGAVA AIR-85 (2016) |  VARUN SINGLA AIR-114 (2016) |  MANI AGARWAL AIR-126 (2016) |  SHASHANK C. AIR-130 (2016) |
|  SUMAN SHEKHAR AIR-133 (2016) |  K. VARUN REDDY AIR-166 (2016) |  CHINMAY MITTAL AIR-235 (2016) |  VISHAL RAJ AIR-242 (2016) |  PRAJESH CHANDRA AIR-264 (2016) |  ASEEM DALAL AIR-275 (2016) |  SINGH NAVRATI A.C. AIR-334 (2016) |  NITHAN RAJ T.N. AIR-476 (2016) |  ATUL PRAKASH AIR-558 (2016) |  KUNAL DUDAWAT AIR-669 (2016) |  RAM PRAKASH AIR-832 (2016) |  SANGEETA MAHALA AIR-946 (2016) |  ESTHER AIR-1075 (2016) |  KUMBHAKAR Y. AIR-08 (2015) |
|  ASHISH SANGWAN AIR-12 (2015) |  SIDHARTH JAIN AIR-13 (2015) |  PRATAP SINGH AIR-15 (2015) |  VALLURU KRANTHI AIR-65 (2015) |  ATUL SHARMA AIR-118 (2015) |  KETAN BANSAL AIR-155 (2015) |  VARUN GUNTUPALLI AIR-183 (2015) |  PADMANABH B. AIR-194 (2015) |  SWAPNIL KHARE AIR-197 (2015) |  SHILPI AIR-198 (2015) |  AKHIL GOEL AIR-251 (2015) |  SAURABH KATIYAR AIR-334 (2015) |  PATEL KOMAL AIR-335 (2015) |  ANKIT AIR-492 (2015) |
|  UTSAV KAUSHAL AIR-500 (2015) |  AKSHAY GODARA AIR-605 (2015) |  MEET KUMAR AIR-699 (2015) |  KUNAL DUDAWAT AIR-699 (2015) |  NITHAN RAJ T.N. AIR-843 (2015) |  SURYA KANT P. AIR-886 (2015) |  PRATAP SINGH B. AIR-1060 (2015) |  NITISH K. AIR-08 (2014) |  GOWTHAM POTRU AIR-30 (2014) |  BHAVESH MISHRA AIR-58 (2014) |  K.Y. VIJAY AIR-145 (2014) |  ANKIT VERMA AIR-145 (2014) |  NIKHIL GOYAL AIR-159 (2014) |  VIJAY GODWA G.C. AIR-175 (2014) |
|  VALLURU KRANTHI AIR-230 (2014) |  SWAPNIL KHARE AIR-236 (2014) |  VARUN GUNTUPALLI AIR-261 (2014) |  PARTH JASWAL AIR-299 (2014) |  MANISH GURWANI AIR-322 (2014) |  ANURAG RAJ AIR-371 (2014) |  PARAS MANI T. AIR-433 (2014) |  AJIT PRATAP SINGH AIR-436 (2014) |  NIKHIL K.R. GARG AIR-608 (2014) |  RAJAT AGARWAL AIR-622 (2014) |  SAURABH KATIYAR AIR-763 (2014) |  PRATAP S. BHUKYA AIR-830 (2014) |  BIPIN KUMAR AIR-861 (2014) |  MEET KUMAR AIR-1150 (2014) |
|  AJIT JOHN JOSHUA AIR-78 (2013) |  SUMIT KUMAR AIR-81 (2013) |  B. SASHI KANT AIR-111 (2013) |  GOWTHAM POTRU AIR-318 (2013) |  RAVINDER SINGH AIR-333 (2013) |  ASHISH MODI AIR-350 (2013) |  PARAS M. TRIPATHI AIR-391 (2013) |  NIKHIL GOYAL AIR-399 (2013) |  NITISH K. AIR-547 (2013) |  KULRAJ SINGH AIR-552 (2013) |  VALLURU KRANTHI AIR-562 (2013) |  SANTOSH KUMAR AIR-1013 (2013) |  RAMESH RAJAN AIR-76 (2012) |  ANKIT VERMA AIR-247 (2012) |
|  B. SASHI KANT AIR-329 (2012) |  KRISHAN KANT AIR-550 (2012) |  VISHAL GARG AIR-560 (2012) |  PRADEEP MISHRA AIR-633 (2012) |  KETAN BANSAL AIR-655 (2012) |  SANJAY K.R. JAIN AIR-667 (2012) |  SANTOSH KUMAR AIR-849 (2012) |  MEET KUMAR AIR-944 (2012) |  HIMANSHU GUPTA AIR-07 (2011) |  ARJIT MUKHERJEE AIR-25 (2011) |  AJAY SINGH TOMAR AIR-88 (2011) |  AWAKASH KUMAR AIR-168 (2011) |  GULNEET SINGH AIR-220 (2011) |  AJIT P. SINGH AIR-288 (2011) |
|  JAY YADAV AIR-372 (2011) |  RAVI VERMA AIR-485 (2011) |  MEGHA AGARWAL AIR-538 (2011) |  G.J. KRUPAKAR AIR-796 (2011) |  ABHISHEK MODI AIR-223 (2011) |  BHAGWATI P. KALAI AIR-154 (2010) |  AWAKASH KUMAR AIR-276 (2010) |  NALMEET AGARWAL AIR-362 (2010) |  AJIT P. SINGH AIR-497 (2010) |  SHAMBU KUMAR AIR-47 (2009) |  A. ARJUN AIR-140 (2009) |  NISHA GUPTA AIR-507 (2009) |  K.V.S.R. KISHORE AIR-575 (2008) | |

HEAD OFFICE: 25/8, Old Rajender Nagar, Delhi-60. BRANCH OFFICE: 105-106, Top Floor, Mukherjee Tower Mukherjee Nagar, Delhi-9

Ph.: 011-45629987, 9999197625 www.ims4maths.com e-Mail: ims4maths@gmail.com

Regional Office: H.No. 1-10-237, 2nd Floor, Room No. 202 R.K'S-Kancham's Blue Sapphire Ashok Nagar, Hyderabad-20. Ph.: 9652351152, 9652661152