Area of Research: Signal Processing/Communication/Equivalent

ANNEXURE I: Shortlisted candidates for REGULAR PhD Programme

No.	SID	Full name
1	21294	MAYANK KUMAR JAIN
2	21295	VINAMRATA
3	21298	JITENDRA KUMAR
4	21347	KOMAL JINDAL
5	21404	ABHISHEK SHRIMALI
6	21431	YASH VERMA
7	21457	AMRITESH KUMAR OJHA
8	21461	HIMANCHAL SINGH
9	21471	MOHAMMAD NAFEES
10	21488	SAKET PATERIYA
11	21494	BIPLAB BAG
12	21509	SUNDARAM
13	21541	SUMAN PAUL CHOUDHURY
14	21615	LOKESH SOBTI
15	21636	ANKUR THAKUR
16	21639	NEENU SHARMA
17	21640	DESHMUKH GAURI ARVIND
18	21645	AMANDEEP KAUR
19	21655	ANJALI
20	21656	AJAY UPADHYAY
21	21662	AMARENDRA KUMAR MISHRA
22	21666	ANURAG AGARWAL
23	21673	AMIT MONGA
24	21739	NIKITA GOEL
25	21745	VIKAS
26	21755	SHAFI JINDAL
27	21763	NAND KUMAR
28	21798	SHILPI
29	21799	HEMANT KUMAR SHARMA
30	21803	AARTI
31	21816	HIMANSU BHUSHAN MOHAPATRA
32	21822	DEVENDRA SINGH PARIHAR
33	21940	PRACHI AGARWAL
34	21948	VIPUL GOEL
35	21971	DEEPAK
36	21995	RITAMBHARA
37	22027	SUMBUL
38	22034	ANKITA RANI
39	22050	ABHILASHA JOSHI
40	22136	INDRA BHOOSHAN SHARMA
41	22148	KHUSHBU
42	22154	SAURABH SINGH RAGHUVANSHI
43	22176	PRATIBHA RATNA PRIYA
44	22188	VAMSHI KRISHNA MUNIPALLE
45	22195	SWATI CHOPRA
46	22196	MANISH KUMAR

47	22226	AVNEET KAUR
48	22227	RITIKA THUSOO
49	22237	CHANDRAVILASH RAI
50	22269	REENA PARIHAR
51	22285	SARITA GUPTA
52	22311	ARPIT KUMAR BARANWAL
53	22324	BHUPINDER KAUR
54	22331	SUKHRAJ SINGH
55	22356	ANKITA SRIVASTAVA
56	22369	HIMANSHU AGARWAL
57	22377	PRAVEEN KUMAR
58	22386	PRIYA PALLAVI
59	22427	SWARNA LAXMI PANDA
60	22445	SATYA NARAYAN AGARWAL
61	22469	JYOTIBHUSAN PADHI
62	22493	KANISHKA KATOCH
63	22494	SUCHITA SARCAR
64	22515	DHANESH
65	22528	DHIRENDRA KUMAR JHA
66	22545	ZIYAUR RAHMAN
67	22572	KRISHNAKANT CHAUBEY
68	22615	HARIKRISHNAN N
69	22616	ASHUTOSH SHARMA
70	22266	ANKIT TRIVEDI

No.	SID	Full name
1	21335	SUDHAKAR RAI
2	21338	MANISHA DHIMAN
3	21420	SAGAR YADAV
4	21435	SHEFALI GUPTA
5	21512	SALIGANTI UMAMAHESH
6	21594	PRIYA GUPTA
7	21682	NAZIA ASLAM
8	21724	JITENDRA SINGH
9	21748	SHAMSHUL HAQUE
10	21767	AKANKSHA JAISWAL
11	21815	RAHUL. LR
12	21915	HEMANT KUMAR
13	21949	RAMPAL BHADU
14	21992	SAURABH CHANDRA
15	22013	GAURAV MAITHANI
16	22051	KISHAN SHIVHARE
17	22059	ANIL KESOO RATHOD
18	22076	KOMALPREET KAUR
19	22201	SHREEKANT BALVANTBHAI PATEL
20	22224	KHALID MAHMOOD TELI
21	22238	HEMANT VERMA
22	22255	MUHSIN K MUHAMED
23	22395	RAVI SINGH KURMVANSHI
24	22430	ABHISHEK KUMAR

25	22509	AWADHESH KUMAR MAURYA
26	22518	PHUTKE SHRUTI SHANTILING
27	22536	MOHAMMAD JIBRAN HAFEEZ
28	22570	AMITOJ SINGH
29	22581	S M GANESH
30	22606	VIKAS KUMAR

No.	SID	Full name
1	21327	JASJOT KAUR SAHOTA
2	21388	RAHUL KUMAR
3	21535	BIPLAB HALDER
4	21566	MANISHA
5	21734	SONIA
6	21757	MOHAN LAL
7	21820	SAWAN KUMAR
8	22327	ALOK KUMAR
9	22424	AMNESH PASWAN
10	22453	TURKEL ANKITA SUNIL
11	22539	MAYANK KUMAR GAUTAM

ANNEXURE III: Shortlisted candidates for ERP PhD Programme

No.	SID	Full name
1	21670	ANURAG SRIVASTAV
2	21942	GOWRI SHANKAR WURITI
3	22381	SUKHDEEP KAUR
4	22447	SANJEEV KUMAR

ANNEXURE IV: Shortlisted candidates for PART TIME PhD Programme

No.	SID	Full name
1	21616	NISARGA CHAND
2	21643	NISHANT MADHUKAR BORKAR
3	21664	KAPIL KUMAR
4	21695	BIJAYA KUMAR MUNI
5	21950	NEHA SHARMA
6	22029	SHANTIMOY NANDAN
7	22254	BURAN BASHA MOHAMMAD
8	22274	SHREYA NAG
9	22479	POOJA GOEL

Any applicant who satisfies the above mentioned criteria, but his/her name is not in the list can also appear for written and/or personal interview on mentioned dates. Provided he/she has already applied with in due date.

ANNEXURE V: Syllabus for PhD written examination

The written examination for short listing the candidates for interview would comprise of two parts – **Part A (General)** and **Part B (Research Area)**. **Part A** would be mandatory for all. Whereas **Part B** will have two sections: (a)

Communication & Electromagnetic theory, (b) Image processing & DSP. Among these two sections of **Part B**, candidates can choose one of them. The Syllabus for the **Part A** and **Part B** written test is:

Part – A (General)

Engineering Mathematics: Vector space, basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness. Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series. Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems. Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stoke's theorems. Complex Analysis: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula; Taylor's and Laurent's series, residue theorem. Numerical Methods: Solution of nonlinear equations, single and multi-step methods for differential equations, convergence criteria. Probability and Statistics: Mean, median, mode and standard deviation; combinatorial probability, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability; Correlation and regression analysis.

Signals and Systems : Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

Part – B (Research Area)

a) Signal Processing/Communication or equivalent:

Communications: Autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; Timing and frequency synchronization, intersymbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Electromagnetics: Electrostatics; Maxwell’s equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth;

Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers.

b) Image and Video Processing or equivalent:

Digital Signal Processing: Sampling and aliasing. Discrete Fourier transform (DFT) and properties, comparison between circular convolution and linear convolution, linear convolution from circular convolution. Direct evaluation of the DFT, The fast Fourier transform, Decimation-in-time (DIT) algorithm, Decimation-in-frequency (DIF) algorithm, differences and similarities between DIT and DIF algorithms and inverse DFT (IDFT). Frequency selective filters, design of digital filters from analog filters, design of lowpass, highpass, bandpass and band stop filters, design of IIR filters from analog filters, realization of digital filters. Linear phase FIR filters, frequency response of linear phase FIR filters and location of zeros, Design of FIR filters using windows, realization of FIR filters.

Digital Image Analysis: Digital image fundamentals; Image Enhancement in Spatial Domain; Gray Level Transformation, Histogram Processing, Spatial Filters; image Transforms; Fourier Transform and their properties, Fast Fourier Transform; Image Enhancement in Frequency Domain; Colour Image Processing; Image warping and restoration; Image Compression; Image Segmentation; edge detection, Hough transform, region based segmentation; Morphological operators; Representation and Description; Features based matching and Bayes classification; Introduction to some computer vision techniques; Imaging geometry.