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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

M. Tech PEPS – Sem II

END SEM EXAMINATION AUG 2022

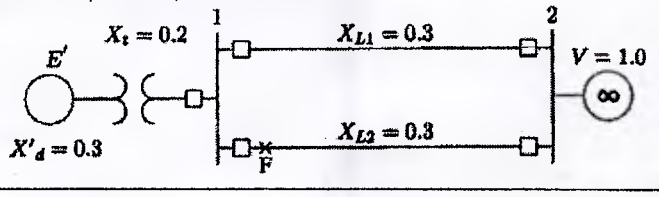
Program: MTech PEPS **Duration: 3 hrs**

Course Code:PEMTPX201 **Maximum Points: 100**

Course Name: Power System Dynamics & Control **Semester:II**

18/8/22

Note: Q.1 is Compulsory. Attempt *ANY 4* Questions from remaining.

Q.No.	Questions	Points	CO	BL
1	Explain the given methods in brief in view of a transient stability improvement 1. High-speed fault clearing 2. Reduction of transmission system reactance 3. Dynamic Braking 4. Steam turbine fast valving 5. High speed excitation systems	20	6	3
2	A 60 Hz synchronous generator having H=5 MJ/MVA and a direct axis transient reactance X'd= 0.3 pu is connected to an infinite bus through a purely reactive circuit as shown in fig. Reactances are marked on the diagram on a common system base. The generator is delivering real power Pe=0.8 pu & Q=0.074 pu to the infinite bus at a voltage of V=1 pu. 1. A temporary three-phase fault occurs at the sending end of the line at point F. When the fault is cleared, both lines are intact. Determine the critical clearing angle and the critical fault clearing time. 2. A three-phase fault occurs at the middle of one of the lines, the fault is cleared, and the faulted line is isolated. Determine the critical clearing angle. Draw separate plots for each case. 	20	5	5

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END SEM EXAMINATION AUG 2022

3	Explain the phenomena of a Voltage stability with the help of following plots- 1. Receiving end voltage, current and power as a function of load demand for the system 2. Power-voltage characteristic of the system 3. Vr-Pr characteristic of the system with different load-power factors	20	7	4
4	Answer following questions regarding stability in detail- 1. Define Stability & explain Small-signal stability. Draw a plot showing Rotor angle response to a transient disturbance & explain it.	20	2	2
5	Draw a detailed chart showing Classification of power system stability & explain Mid-term & Long-term stability in brief.	20	1	3
6	Obtain derivations of the following- 1. Equal area criterion 2. Numerical solution of the swing equation	20	5	1
7	Attempt following questions regarding modelling of a synchronous machine- 1. Derive λabc and λr in terms of Lss, Lsr and Lrs, Lrr respectively. 2. Apply dqo transformations to stator flux equations & obtain λd, λq & λo in terms of Imd, Imq, I1s, Is1d, Is1q and Isfd.	20	3	3

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End Sem - July 2022 Examinations

Program: M. Tech PEPS

Course Code: PC-MTPX 202

Course Name: Advanced Control of Electrical Drives

Duration: 3Hr

Maximum Points: 100

Semester: II

27/8/22

Notes:

- Attempt **any five** questions.
- Assume suitable data **if** required and justify.
- Refrain from using any unfair means during this exam.

Q.No.	Questions	Points	CO	BL	PI
Q1a)	With the Principles of phase control theory explain single phase half-controlled rectifier control and single phase fully controlled rectifier control of separately excited motor.	**10**	3	3	1.3.1
b)	A 200 V, 1500 rpm, 50 A separately excited de motor has an armature resistance of 0.5 Ω is fed from a three phase Fully-controlled rectifier. Available A.C. source has a line voltage of 440V, 5011z. A star-delta connected transformer is used to Feed the armature so that the motor terminal voltage equals the rated voltage when converter firing angle is zero. (i) Calculate transformer turns ratio. (ii) Determine the firing angle when motor is running at 1200 rpm and at rated torque. (iii) Determine the firing angle when motor is running at -800 rpm and at twice the rated torque.	10	3	2	2.4.1
Q2 a)	A 220 V, 960 rpm, 12.8 A separately excited dc motor has armature circuit resistance and inductance of 2 ohm and 150 mH, respectively. It is fed from a single phase half controlled rectifier with an c source voltage of 230 V, 50 Hz. Calculate i) Motor torque for α = 60° and speed = 600 rpm ii) Motor speed for α = 60° and T = 20 N-m	**10**	2	3	2.4.1
b)	Derive the state space model of separately excited DC motor Or Elaborate the braking and multi quadrant operation of VSI Induction motor drives. (dynamic and regenerative braking)	**10**	3	3	1.3.1
Q3a)	A 400 volts ,50 Hz , 4 pole, 1370 rpm star connected induction motor is supplied from a current regulated PWM voltage source inverter and is operated with rotor flux oriented control. The motor parameters are given as Rs' = 2 ohm, Rr' = 5 ohms, Xls = Xlr' = 5 ohms, Xm = 80 ohms, all reactances are calculated at 50 Hz. Neglect friction and core losses.	**10**	5	3	2.4.1

	a) Find the required values of Ids and Iqs to operate the motor at rated speed, if the terminal voltage and frequency are kept at the rated value b) Calculate the torque and slip frequency in rad/sec under the condition (a)				
b)	Explain Field Oriented Control of IM and derive its DC analogy.	**10**	5	2	1.3.1
Q4	Explain **Direct torque control** of Induction Machines? Derive the torque expression with stator and rotor fluxes, and also explain DTC hysteresis control strategy.	**20**	5	5	1.3.1
Q5a)	Explain Current ripple and its effect on performance of separately excited DC motor drive.	**10**	2	2	1.3.1
b)	A 3-phase, 460 volts, 60 Hz, 6 pole, Y connected cylindrical rotor synchronous motor has a synchronous reactance of Xs = 2.5 ohms and armature resistance is negligible. The load torque, which is proportional to the speed squared is TL = 398 Nm at 1200 rpm. The PF is maintained at unity by field control and the voltage to frequency ratio is kept constant at the rated value. If the inverter frequency is 36 Hz and the motor speed is 720 rpm, calculate a) the input voltage Va, b) the armature current Ia, c) the excitation voltage Vf, d) the torque angle δ, and e) the pull out torque Tp.	**10**	4	3	2.4.1
Q6a)	Explain in detail permanent magnet motors? Why are they called brushless motors? Derive the torque equation $T_e = \frac{3}{2} \times \frac{p}{2} \times \Psi_{rf} i_s = K_f \Psi_{rf} i_s \, \mathrm{N \cdot m}$	**10**	5	3	1.3.1
b)	Give a brief comparison of the D.C. drive response with P, PI and PID controllers	**10**	3	2	1.3.1
Q7	Write short notes on any two i) CSI fed induction machine ii) Direct and Indirect vector control methods of IM iii) Synchronous rotating reference frame theory of IM	**20**	3	3	1.3.1

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End Sem - Aug 2022 Examinations

Program: M. Tech PEPS **Duration: 3 Hr**

Course Code: PE-MTPX 201 **Maximum Points: 100**

Course Name: Advanced Techniques in Power System Protection **Semester: II**

21/8/22

Notes:

- Attempt **any five** questions.
- Assume suitable data **if** required and justify.
- Refrain from using any unfair means during this exam.

Q. No	Questions	Points	CO	BL	PI
Q1 a)	The currents in a 3 phase unbalanced system are given by $\vec{I_a} = (10+j4)A$, $\vec{I_b} = (11-j9)A$, $\vec{I_c} = (-15+j9)A$ Calculate the zero, positive and negative sequence currents.	10	2	2	1.3.1
b)	Based on the- Bergeron's scheme for travelling wave protection explain the principle of internal fault-detection.	10	2	2	1.3.1
Q2 a)	Explain neatly in detail each component with diagram the basic elements of digital protection in power system.	10	2	2	1.3.1
b)	Using the method of least squares, find an equation of the form $y = ax + b$ that fits the following data: x 0 1 2 3 4 y 1 5 10 22 38	10	2	3	2.4.1
Q3 a)	Explain Sample and first derivative sinusoidal wave based algorithms (Mann and Morrison)	10	2	3	1.3.1
b)	Out of step blocking and tripping schemes of transmission line protection (power swings and protective relaying)	10	2	2	1.3.1

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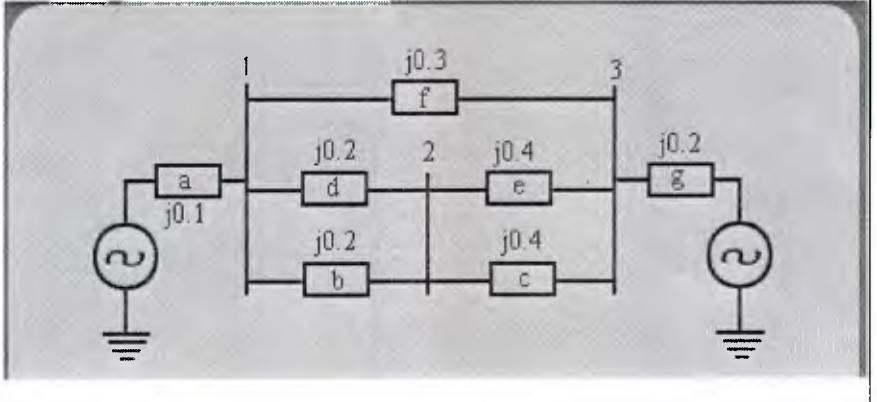
End Sem - Aug 2022 Examinations

Q.No.	Questions	Points	CO	BL	PI
Q4a)	Write briefly about Intelligent load shedding and Intelligent islanding.	10	2	3	1.3.1
b)	Derive two sample estimation technique. Discuss its limitations.	10	2	3	1.3.1
Q5	For the system shown in figure find out in detailed step by step with explanation whether power swing passes through a) the transmission lines 'b' and b) the transmission line "c"? 	20	2	4	1.3.1
Q6a)	What is phasor measurement unit? Explain architecture of Wide Area Measurement systems.	10	2	3	1.3.1
b)	Write short note on Travelling Wave based techniques in protective relaying.	10	2	3	1.3.1
Q7	Write short notes on any **two** I) Modelling of Current transformer II) Adaptive relaying for transmission lines III) Over current relay coordination iv) Digital differential Protection of bus bar	20	2	3	1.3.1

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END SEM EXAMINATION AUG 2022

Program: MTech PEPS | **Duration: 3 hrs**

Course Code:PEMTPX202 | **Maximum Points: 100**

Course Name: Smart Grid Technology | **Semester:II**

26/8/22

Note: Q.1 is Compulsory. Attempt *ANY 4* Questions from remaining.

Q.No.	Questions	Points	CO	BL
1	Explain in detail- Cyber security in view of a power system	20	6	4
2	Write notes on following terms related to Substation Automation- 1. SCADA & DCS 2. IEC61850 3. RTU 4. IED	20	3	2
3	Give answers of following questions regarding a fuel cell- 1. What is a fuel cell? 2. How does it work? 3. How's its configuration ? 4. Which are different types of fuel cells?	20	4	4
4	Define Harmonics & answer following question regarding it in detail- 1. Triplen harmonics in a four-wire system 2. Odd & Even harmonics 3. Triplen harmonics in transformer 4. K-factor	20	5	5
5	Explain the concept of home & building automation. Also enlist & briefly explain each ofany 5 smart devices & 5 smart sensors that are used for this purpose.	20	2	3
6	Explain following wired technologies in view of a smart grid- 1. PLCC 2. FOC	20	6	2
7	Write notes on following terms related to a Smart grid- 1. Need of a smart grid 2. NIST model of smart grid 3. Functions of a smart grid 4. Grid Resilience	20	1	1

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ENDSEM Examinations, AUGUST 2022

Total points:100

Duration: *Total Time allotted will be 3Hr.*

Class: M. TECH(CM) & MTECH(STR) & MTECH(PEPS) Semester: II Program: Civil

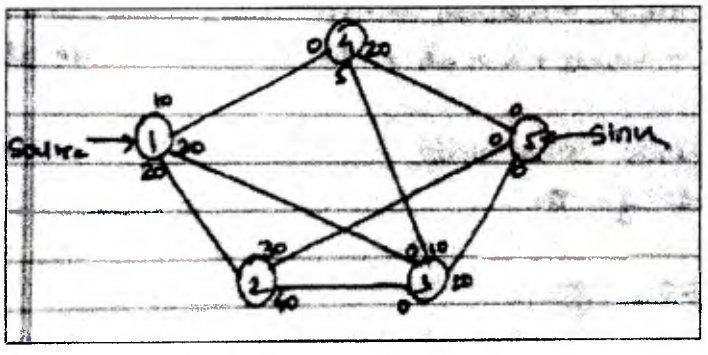
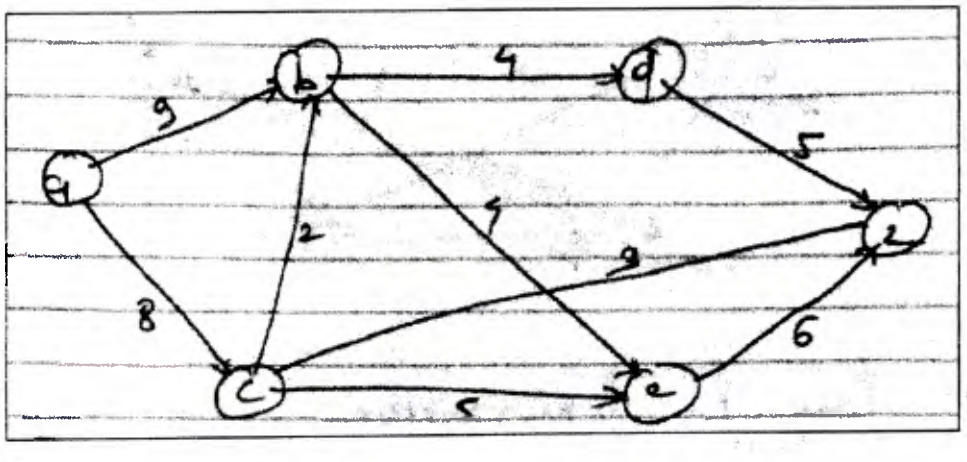
Name of the Course-Operational Research **Course** Code : OE-PG03 PC-MTCM-202

29/8/22

Instructions:

1. **Solve Q2 OR Q5 compulsory**
2. Draw neat diagrams
3. Assume suitable data if necessary and state the clearly.

		Points	CO	BL	PI
Q1(A)	Solve Following LPP by using Kuhn-Tuckers conditions Max Z = $-X_1^2 - X_2^2 - X_3^2 + 4X_1 + 6X_2$ Subject to, X1+X2 <= 2 2X1+3X2 <= 12 X1, X2 >= 0	10	2,4	4	2.2.2
Q1(B)	There are 5 jobs, each of which must go through the machines A and B in the order AB. The processing times (in hours) are given as JOB | J1 | J2 | J3 | J4 | J5 MACHINE A | 2 | 4 | 5 | 7 | 1 MACHINE B | 3 | 6 | 1 | 4 | 8 Determine a sequence of these jobs that will minimise the total elapsed time T. Also obtain: I) the minimum elapsed time; and ii) the idle time for each of the machines.	10	3,4	3	4.2.1
Q2	Solve following LPP by revised simplex method Max Z = X1+2X2 Subject to, X1+X2 <= 3 X1+X2 <= 5	20	1,2	4	3.2.1

	3X1+X2 < = 6 X1, X2 >= 0				
Q3(A)	If for a project, annual demand is 10000/year, order cost=300/order, carrying cost = Rs 4/unit/year then 1. Estimate Economic order quantity and Total cost of project 2. If backorder cost is 25/unit/year, then Estimate Economic order quantity and Total cost of project.	10	2,4	4	4.3.2
Q3(B)	 Find the maximum flow above in the Model.	10	2,4	3	2.3.2
Q4(A)	Customers arrive at the clinic at the rate of 8/hour (Poisson's Ratio), And doctor can serve at the rate of 9/hour (Exponential), 1. What is the probability that customer does not join the que and walks in doctor's room? 2. What is the probability that there is no que? 3. What is the probability that there are 10 customers in the que? 4. What is the expected number in the system? 5. What is the expected waiting time in the que?	10	3,4	4	2.3.2
Q4(B)	 The values above arrow represents flow capacity Find the maximum values for above transport network.	10	2,4	3	4.3.3

Q5	Minimise f(x) = $7 * X_1 * X_2^{-1} + 3 * X_2 * X_3^{-2} + 5 * X_1^{-3} * X_2 * X_3 + X_1 * X_2 * X_3$ Where, X1, X2, X3 >= 0 Solve above model using geometric programming	20	1,3	5	3.2.1
Q6(A)	A trader stocks a particular seasonal product at the beginning of the season and cannot re-order. The item costs him Rs. 25 each and he sells at Rs. 50 each. For any item that cannot be met on demand, the trader has estimated a goodwill cost of Rs. 15. Any item unsold will have a salvage value of Rs. 10. Holding cost during the period is estimated to be 10 per cent of the price. The probability distribution of demand is as follows: Determine the optimal number of items to be stocked.	10	3,1	5	3.2.2
Q6(B)	An organization is planning to diversify its business with a maximum outlay Rs. 4 crores. It has identified three different locations to install plants. The organization can invest in one or more of these plants subject to the availability of the fund. The different alternatives and their investment (in crores of rupees) and present worth of returns during useful life (in crores of rupees) of each of these plants are summarized in table. The first row of table has zero cost and zero return for all the plants. Hence, it is known as do-nothing alternative. Find the optimal allocation of the capital to different plants which will maximize the corresponding sum of the present worth of returns.	10	1,4	5	3.2.1
Q7(A)		10	1,3	4	1.2.3

Unit Stocked	2	3	4	5	6
Probability of demand	0.35	0.25	0.20	0.15	0.05

Alternatives	Plant 1		Plant 2		Plant 3	
	Cost	Return	Cost	Return	Cost	Return
1	0	0	0	0	0	0
2	1	12	2	16	2	9
3	2	15	3	20	3	12
4	3	19	4	25	-	-

Activity	Duration
1-2	8
1-3	10
1-4	5
2-7	6
3-4	3
4-5	7
4-7	0
5-6	4
5-7	3
5-8	6

	6-8	5			
	7-8	5			

Determines all types of floats and critical Path using information given in above table.

Q7(B)					10	1,3	4	1.2.3

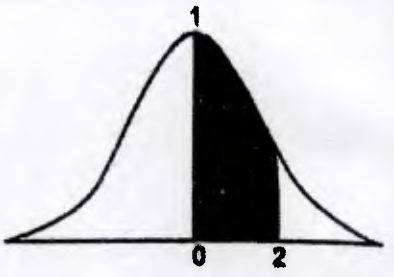
Activity	Predecessor(s)	Duration(weeks)		
		a	m	b
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A, B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	4
I	E, F	4	4	10
J	D, H	2	5	14
K	I ,G	2	2	8

I) Construct the project network
II) Find expected duration and variance of each activity
III) Find critical path and expected project duration time
IV) What is the probability of completing the project on or before 25 weeks?

If the probability of completing the project is 0.84 find expected project completion time.

Table 1: Area Under Normal Curve

An entry in the table is the proportion under the entire curve which is between $z = 0$ and a positive value of z. Areas for negative values for z are obtained by symmetry.



Areas of a standard normal distribution

z	.0	0.01	.02	.03	.04	.05	.06	.07	.08	.09
0	.0000	.0040	.0080	.0120	.0160	.0199	.0239	.0279	.0319	.0359
.1	.0398	.0438	.0478	.0517	.0557	.0596	.0636	.0675	.0714	.0753
.2	.0793	.0832	.0871	.0910	.0948	.0987	.1026	.1064	.1103	.1141
.3	.1179	.1217	.1255	.1293	.1331	.1368	.1406	.1443	.1480	.1517
.4	.1554	.1591	.1628	.1664	.1700	.1736	.1772	.1808	.1844	.1879
.5	.1915	.1950	.1985	.2019	.2054	.2088	.2123	.2157	.2190	.2224
.6	.2257	.2291	.2324	.2357	.2389	.2422	.2454	.2486	.2517	.2549
.7	.2580	.2611	.2642	.2673	.2903	.2734	.2764	.2794	.2823	.2852
.8	.2881	.2910	.2939	.2967	.2995	.3023	.3051	.3078	.3106	.3133
.9	.3159	.3186	.3212	.3238	.3264	.3289	.3315	.3340	.3365	.3389
1.0	.3413	.3438	.3461	.3485	.3508	.3531	.3554	.3577	.3599	.3621
1.1	.3643	.3665	.3686	.3708	.3729	.3749	.3770	.3790	.3810	.3830
1.2	.3849	.3869	.3888	.3907	.3925	.3944	.3962	.3980	.3997	.4015
1.3	.4032	.4049	.4066	.4082	.4099	.4115	.4131	.4147	.4162	.4177
1.4	.4192	.4207	.4222	.4236	.4251	.4265	.4279	.4292	.4306	.4319
1.5	.4332	.4345	.4357	.4370	.4382	.4394	.4406	.4418	.4429	.4441
1.6	.4452	.4463	.4474	.4484	.4495	.4505	.4515	.4525	.4535	.4545
1.7	.4554	.4564	.4573	.4582	.4591	.4599	.4608	.4616	.4625	.4633
1.8	.4641	.4649	.4656	.4664	.4671	.4678	.4686	.4693	.4699	.4706
1.9	.4713	.4719	.4726	.4732	.4738	.4744	.4750	.4756	.4761	.4767
2.0	.4772	.4778	.4783	.4788	.4793	.4798	.4803	.4808	.4812	.4817
2.1	.4821	.4826	.4830	.4834	.4838	.4842	.4846	.4850	.4854	.4857
2.2	.4861	.4864	.4868	.4871	.4875	.4878	.4881	.4884	.4887	.4890
2.3	.4893	.4896	.4898	.4901	.4904	.4906	.4909	.4911	.4913	.4916
2.4	.4918	.4920	.4922	.4925	.4927	.4929	.4931	.4932	.4934	.4936
2.5	.4938	.4940	.4941	.4943	.4945	.4946	.4948	.4949	.4951	.4952
2.6	.4953	.4955	.4956	.4957	.4959	.4960	.4961	.4962	.4963	.4964
2.7	.4965	.4966	.4967	.4968	.4969	.4970	.4971	.4972	.4973	.4974
2.8	.4974	.4975	.4976	.4977	.4977	.4978	.4979	.4979	.4980	.4981
2.9	.4981	.4982	.4982	.4983	.4984	.4984	.4985	.4985	.4986	.4986
3.0	.4987	.4987	.4987	.4988	.4988	.4989	.4989	.4989	.4990	.4990

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End Semester – August 2022 Examinations

Program: F Y M.Tech PEPS - Sem II **Duration: 3** Hours
Course Code:AU-PG-03; AU-MTPX201 **Maximum Points:100**
Course Name: Disaster Management **Semester: II**

20/8/22

Notes: 1. Answer any five questions.
2 All questions carry 20 points.

Q.No.	Questions	Points	CO	BL	PI
1	1.1 What is Disaster Risk Assessment? What are the seven steps in Disaster Risk Assessment?	10	4	2	2.1.2
	1.2 List out the four components of Community Risk Assessment. Explain each one of these components.	10	2	2	11.3.1
2	2.1 What are the seven Global targets of the Sendai Framework for Disaster Risk Reduction? What was the status of Target E by 2019?	10	3	2	11.3.1
	2.2 What are the four Global priorities for action of the Sendai Framework for Disaster Risk Reduction?	10	1	2	11.3.2
3	3.1 What is Disaster Mitigation? How does it differ from other disaster management disciplines/phases? What are goals of Disaster Mitigation?	10	4	2	6.1.1
	3.2 Explain structural and non-structural activities in Disaster Mitigation. What are active and passive measures in Disaster Mitigation?	10	3	2	3.1.6
4	4.1 What is the aim of Disaster/Emergency Response? List out the key activities and elements of Disaster Response.	10	3	4	3.4.1
	4.2 Explain the three Humanitarian Principles that Humanitarian agencies must observe while responding to Disasters.	10	2	3	1.2.1
Q.No.	**Questions**	**Points**	**CO**	**BL**	PI

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End Semester – August 2022 Examinations

5	5.1 What are the three levels and responsibilities of Disaster Management Authorities specified in Disaster Management Act, 2005?	10	4	2	6.1.1
	5.2 What are the objectives of the National Cyclone Risk Mitigation Project? Write a note on Phase II of NCRMP.	10	4	2	2.1.2
6	6.1 Write an explanatory note on Disaster Recovery.	10	2	2	11.1
	6.2 Explain 'Resilience' and 'Capacity' in the context of Disaster Management	10	3	2	11.3.1
7	7.1 Riverine flooding is perhaps the most critical climate-related hazard in India. Explain	10	1	2	11.3.2
	7.2. With the help of a diagram explain the four phases of the Disaster Management Cycle. Mark the point in the cycle where the disaster occurs.	10	4	2	6.1.1