

L-2/T-2/NAME

Date: 19/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B.Sc. Engineering Examination, January 2020

Sub: HUM 211 (Sociology)

Full Marks: 120

Time 2 Hours

The Figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

There are 02 page(s) in this question paper.

SECTION - A

There are **FOUR** questions in this section. Answer any **THREE**

1. (a) Sociological imagination is a creative way to explain social relationships- (10)
Explain.
- (b) Write down the properties of structural functionalism. (10)
2. (a) What is social stratification? Explain estate system and social class system of (10)
social stratification.
- (b) Explain different types of social mobility with examples. (10)
3. (a) Briefly explain the concept 'cultural lag' with examples. (10)
- (b) What do you understand by sub-culture and counter culture? (10)
4. Write short notes on any two of the following: (20)
 - (a) Work place safety culture.
 - (b) Mead's theory of socialization.
 - (c) Agents of socialization.

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**

5. (a) Discuss the impact of industrial revolution. (10)
- (b) Define capitalism. What are the three distinctive features of capitalism? (10)
6. (a) What do you understand by deviance? Analyze the major causes of deviance in Bangladesh. (10)
- (b) Identify the symptoms of juvenile delinquency and enumerate the causes of the gradual increase of this problem. (10)
7. (a) Define ecology. Explain the characteristics of third world urbanization, using Dhaka as a case. (10)
- (b) Discuss Malthus's theory of population growth. (10)
8. Write short notes on any two of the following: (20)
- (a) Socialism.
- (b) Food collecting economy.
- (c) Types of family.

L-2/T-2/NAME

Date:16/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-2 B. Sc. Engineering Examinations 2019-2020

Sub: **MATH 283** (Statistics, Partial differential Equation and Matrices)

Full Marks: 180

Time: 2 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Symbols used have their usual meaning.

SECTION-A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Solve $x^k(z^{k+1} - y^{k+1})p + y^k(x^{k+1} - z^{k+1})q = z^k(y^{k+1} - x^{k+1})$. (15)
where $k =$ last digit in your student number and $k = 10$, when last digit is equal zero in your student number.

- (b) Apply Charpit's method to find complete integral of (15)
 $(p^2 + q^2)y = qz$.

2. (a) Solve: $(D_x^2 + D_x D_y - 6D_y^2)z = e^{3x+y} + \cos(2x + y)$. (15)

- (b) Solve: $\left(x^2 \frac{\partial^2 z}{\partial x^2} - 4xy \frac{\partial^2 z}{\partial x \partial y} + 4y^2 \frac{\partial^2 z}{\partial y^2} + 6y \frac{\partial z}{\partial y}\right) = x^3 y^4$ (15)

3. (a) Find the canonical matrix of $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 0 \\ 6 & 7 & 8 \end{bmatrix}$ and hence find rank. (15)

- (b) Using only elementary row transformation, to reduce A to I, find the inverse of (15)
 $A = \begin{bmatrix} k+1 & 0 & -2 \\ k & 1 & 0 \\ k & 1 & 1 \end{bmatrix}$

where $k =$ last digit in your student number and $k = 10$ when last digit is equal zero in your student number.

4. (a) Solve the following system of linear equations by converting it to matrix form: (18)

$$3x - y - z = k + 13$$

$$2x + y - 2z = k + 13$$

$$5x - 5y + 2z = 2k + 21$$

$$kx - ky + z = 2k + 8$$

where $k =$ last digit in your student number and $k = 10$ when last digit is equal zero in your student number.

- (b) Find the eigen values and eigen vector corresponding to lowest eigen value of (12)

the matrix $A = \begin{bmatrix} 1 & 0 & -1 \\ 1 & 2 & 1 \\ 2 & 2 & 3 \end{bmatrix}$

SECTION-B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) State Cayley-Hamilton theorem and using this theorem, find A^{-1} , when (13)
- $$A = \begin{pmatrix} 2 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 2 \end{pmatrix}.$$
- (b) Reduce the real quadratic form $12x^2 + 4y^2 + 5z^2 - 6xy - 4yz + 6xz$ to the canonical form and hence find the rank, signature, index of the form. (17)
6. (a) From the data calculate coefficient of skewness and comment on your result. (20)
- | | | | | | | | |
|-----------|----|----|----|----|----|----|-----|
| Age below | 25 | 30 | 35 | 40 | 45 | 50 | 55 |
| Employees | 8 | 20 | 40 | 65 | 80 | 92 | 100 |
- (b) The following table show distance to transmitter (X) and corresponding wireless signal strength (Y): (10)
- | | | | | | | | | | | |
|---|------|------|------|------|------|------|------|------|------|------|
| X | 13 | 1 | 17 | 19 | 14 | 15 | 15 | 8 | 13 | 3 |
| Y | 34.4 | 38.4 | 30.4 | 29.7 | 30.1 | 33.9 | 32.8 | 35.2 | 34.9 | 36.8 |
- i. Find the regression line of Y on X. ii. Predict what the signal strength would be if the distance was 10 meters.
7. (a) A fire brigade has two fire engines operating independently. The probability that a specific fire engine is available when needed is 0.99. (10)
- (i) What is the probability that an engine is available when needed?
- (ii) What is the probability that neither is available when needed?
- (b) Consider the following probability distribution of X and Y. (20)
- $$f(x, y) = \frac{x + y}{21}, \quad x = 1, 2, 3 \text{ and } y = 1, 2.$$
- (i) Obtain the marginal of X and conditional distributions of Y.
- (ii) Find $f(x \setminus 1)$ and (iii) $p(X = 2 \setminus Y = 1)$.
8. (a) The income of a group of 10,000 persons was found to be normally distributed with mean Tk.1750 and standard deviation Tk.50. Show that of this group 95% had income exceeding Tk.1668 and only 5% had income exceeding Tk.1832. What was the lowest income among the richest 100? (15)
- (b) From a certain city 400 labours were selected at random. Their mean income was Tk.1700 per month with a standard deviation of Tk.140. Set up 95% confidence limits within which the income of the labour community of the district is expected to lie. (15)

(Please use this table for question 8(a))
Table of the standard normal distribution values ($z \leq 0$)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.49601	0.49202	0.48803	0.48405	0.48006	0.47608	0.47210	0.46812	0.46414
0.1	0.46017	0.45621	0.45224	0.44828	0.44433	0.44038	0.43644	0.43251	0.42858	0.42466
0.2	0.42074	0.41683	0.41294	0.40905	0.40517	0.40129	0.39743	0.39358	0.38974	0.38591
0.3	0.38209	0.37828	0.37448	0.37070	0.36693	0.36317	0.35942	0.35569	0.35197	0.34827
0.4	0.34458	0.34090	0.33724	0.33360	0.32997	0.32636	0.32276	0.31918	0.31561	0.31207
0.5	0.30854	0.30503	0.30153	0.29806	0.29460	0.29116	0.28774	0.28434	0.28096	0.27760
0.6	0.27425	0.27093	0.26763	0.26435	0.26109	0.25785	0.25463	0.25143	0.24825	0.24510
0.7	0.24196	0.23885	0.23576	0.23270	0.22965	0.22663	0.22363	0.22065	0.21770	0.21476
0.8	0.21186	0.20897	0.20611	0.20327	0.20045	0.19766	0.19489	0.19215	0.18943	0.18673
0.9	0.18406	0.18141	0.17879	0.17619	0.17361	0.17106	0.16853	0.16602	0.16354	0.16109
1.0	0.15866	0.15625	0.15386	0.15151	0.14917	0.14686	0.14457	0.14231	0.14007	0.13786
1.1	0.13567	0.13350	0.13136	0.12924	0.12714	0.12507	0.12302	0.12100	0.11900	0.11702
1.2	0.11507	0.11314	0.11123	0.10935	0.10749	0.10565	0.10384	0.10204	0.10027	0.09853
1.3	0.09680	0.09510	0.09342	0.09176	0.09012	0.08851	0.08692	0.08534	0.08379	0.08226
1.4	0.08076	0.07927	0.07780	0.07636	0.07493	0.07353	0.07215	0.07078	0.06944	0.06811
1.5	0.06681	0.06552	0.06426	0.06301	0.06178	0.06057	0.05938	0.05821	0.05705	0.05592
1.6	0.05480	0.05370	0.05262	0.05155	0.05050	0.04947	0.04846	0.04746	0.04648	0.04551
1.7	0.04457	0.04363	0.04272	0.04182	0.04093	0.04006	0.03920	0.03836	0.03754	0.03673
1.8	0.03593	0.03515	0.03438	0.03363	0.03288	0.03216	0.03144	0.03074	0.03005	0.02938
1.9	0.02872	0.02807	0.02743	0.02680	0.02619	0.02559	0.02500	0.02442	0.02385	0.02330
2.0	0.02275	0.02222	0.02169	0.02118	0.02068	0.02018	0.01970	0.01923	0.01876	0.01831
2.1	0.01786	0.01743	0.01700	0.01659	0.01618	0.01578	0.01539	0.01500	0.01463	0.01426
2.2	0.01390	0.01355	0.01321	0.01287	0.01255	0.01222	0.01191	0.01160	0.01130	0.01101
2.3	0.01072	0.01044	0.01017	0.00990	0.00964	0.00939	0.00914	0.00889	0.00866	0.00842
2.4	0.00820	0.00798	0.00776	0.00755	0.00734	0.00714	0.00695	0.00676	0.00657	0.00639
2.5	0.00621	0.00604	0.00587	0.00570	0.00554	0.00539	0.00523	0.00509	0.00494	0.00480
2.6	0.00466	0.00453	0.00440	0.00427	0.00415	0.00403	0.00391	0.00379	0.00368	0.00357
2.7	0.00347	0.00336	0.00326	0.00317	0.00307	0.00298	0.00289	0.00280	0.00272	0.00264
2.8	0.00256	0.00248	0.00240	0.00233	0.00226	0.00219	0.00212	0.00205	0.00199	0.00193
2.9	0.00187	0.00181	0.00175	0.00170	0.00164	0.00159	0.00154	0.00149	0.00144	0.00140
3.0	0.00135	0.00131	0.00126	0.00122	0.00118	0.00114	0.00111	0.00107	0.00104	0.00100
3.1	0.00097	0.00094	0.00090	0.00087	0.00085	0.00082	0.00079	0.00076	0.00074	0.00071
3.2	0.00069	0.00066	0.00064	0.00062	0.00060	0.00058	0.00056	0.00054	0.00052	0.00050
3.3	0.00048	0.00047	0.00045	0.00043	0.00042	0.00040	0.00039	0.00038	0.00036	0.00035
3.4	0.00034	0.00033	0.00031	0.00030	0.00029	0.00028	0.00027	0.00026	0.00025	0.00024
3.5	0.00023	0.00022	0.00022	0.00021	0.00020	0.00019	0.00019	0.00018	0.00017	0.00017

Table of the standard normal distribution values ($z \geq 0$)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.50000	0.50399	0.50798	0.51197	0.51595	0.51994	0.52392	0.52790	0.53188	0.53586
0.1	0.53983	0.54380	0.54776	0.55172	0.55567	0.55962	0.56356	0.56749	0.57142	0.57535
0.2	0.57926	0.58317	0.58706	0.59095	0.59483	0.59871	0.60257	0.60642	0.61026	0.61409
0.3	0.61791	0.62172	0.62552	0.62930	0.63307	0.63683	0.64058	0.64431	0.64803	0.65173
0.4	0.65542	0.65910	0.66276	0.66640	0.67003	0.67364	0.67724	0.68082	0.68439	0.68793
0.5	0.69146	0.69497	0.69847	0.70194	0.70540	0.70884	0.71226	0.71566	0.71904	0.72240
0.6	0.72575	0.72907	0.73237	0.73565	0.73891	0.74215	0.74537	0.74857	0.75175	0.75490
0.7	0.75804	0.76115	0.76424	0.76730	0.77035	0.77337	0.77637	0.77935	0.78230	0.78524
0.8	0.78814	0.79103	0.79389	0.79673	0.79955	0.80234	0.80511	0.80785	0.81057	0.81327
0.9	0.81594	0.81859	0.82121	0.82381	0.82639	0.82894	0.83147	0.83398	0.83646	0.83891
1.0	0.84134	0.84375	0.84614	0.84849	0.85083	0.85314	0.85543	0.85769	0.85993	0.86214
1.1	0.86433	0.86650	0.86864	0.87076	0.87286	0.87493	0.87698	0.87900	0.88100	0.88298
1.2	0.88493	0.88686	0.88877	0.89065	0.89251	0.89435	0.89617	0.89796	0.89973	0.90147
1.3	0.90320	0.90490	0.90658	0.90824	0.90988	0.91149	0.91308	0.91466	0.91621	0.91774
1.4	0.91924	0.92073	0.92220	0.92364	0.92507	0.92647	0.92785	0.92922	0.93056	0.93189
1.5	0.93319	0.93448	0.93574	0.93699	0.93822	0.93943	0.94062	0.94179	0.94295	0.94408
1.6	0.94520	0.94630	0.94738	0.94845	0.94950	0.95053	0.95154	0.95254	0.95352	0.95449
1.7	0.95543	0.95637	0.95728	0.95818	0.95907	0.95994	0.96080	0.96164	0.96246	0.96327
1.8	0.96407	0.96485	0.96562	0.96638	0.96712	0.96784	0.96856	0.96926	0.96995	0.97062
1.9	0.97128	0.97193	0.97257	0.97320	0.97381	0.97441	0.97500	0.97558	0.97615	0.97670
2.0	0.97725	0.97778	0.97831	0.97882	0.97932	0.97982	0.98030	0.98077	0.98124	0.98169
2.1	0.98214	0.98257	0.98300	0.98341	0.98382	0.98422	0.98461	0.98500	0.98537	0.98574
2.2	0.98610	0.98645	0.98679	0.98713	0.98745	0.98778	0.98809	0.98840	0.98870	0.98899
2.3	0.98928	0.98956	0.98983	0.99010	0.99036	0.99061	0.99086	0.99111	0.99134	0.99158
2.4	0.99180	0.99202	0.99224	0.99245	0.99266	0.99286	0.99305	0.99324	0.99343	0.99361
2.5	0.99379	0.99396	0.99413	0.99430	0.99446	0.99461	0.99477	0.99492	0.99506	0.99520
2.6	0.99534	0.99547	0.99560	0.99573	0.99585	0.99598	0.99609	0.99621	0.99632	0.99643
2.7	0.99653	0.99664	0.99674	0.99683	0.99693	0.99702	0.99711	0.99720	0.99728	0.99736
2.8	0.99744	0.99752	0.99760	0.99767	0.99774	0.99781	0.99788	0.99795	0.99801	0.99807
2.9	0.99813	0.99819	0.99825	0.99831	0.99836	0.99841	0.99846	0.99851	0.99856	0.99861
3.0	0.99865	0.99869	0.99874	0.99878	0.99882	0.99886	0.99889	0.99893	0.99896	0.99900
3.1	0.99903	0.99906	0.99910	0.99913	0.99916	0.99918	0.99921	0.99924	0.99926	0.99929
3.2	0.99931	0.99934	0.99936	0.99938	0.99940	0.99942	0.99944	0.99946	0.99948	0.99950
3.3	0.99952	0.99953	0.99955	0.99957	0.99958	0.99960	0.99961	0.99962	0.99964	0.99965
3.4	0.99966	0.99968	0.99969	0.99970	0.99971	0.99972	0.99973	0.99974	0.99975	0.99976
3.5	0.99977	0.99978	0.99978	0.99979	0.99980	0.99981	0.99981	0.99982	0.99983	0.99983

L-2/T-2/NAME

Date: 09/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-2/T-II B.Sc. Engineering Examination 2018-19

Sub: **EEE 261** (Electrical and Electronic Technology for Marine Engineers)

Full Marks: 180

Time 2 Hours

The Figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

There are 5 page(s) in this question paper.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**

All the symbols have their usual meanings

Assume reasonable values for missing data.

1. (a) Design a circuit that has the input-output characteristics shown in Fig. 1(a). (15)
Clearly mark the input and output terminals. Assume ideal diode. Show the output waveform if $v_{in} = 7 \sin(200\pi t)$.

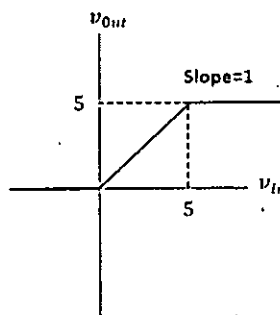


Fig. 1(a)

- (b) A zener diode exhibits a constant voltage of 5.6 V for currents greater than five times the knee current. $I_{ZK}=1$ mA. This zener diode is to be used in the design of a shunt regulator fed from a 15-V supply as shown in Fig. 1(b). The load current varies over the range of 0 mA to 15 mA. Find a suitable value for the resistor R. What is the maximum power dissipation of the zener diode? (15)

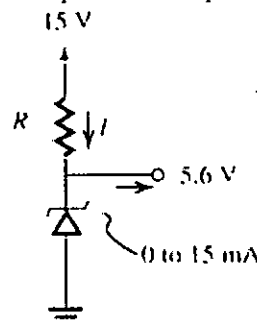


Fig. 1(b)

= 2 =

2. (a) Analyze the circuit shown in Fig. 2(a) to determine the voltages at all nodes and current through all branches. Given that $\beta = 150$. (15)

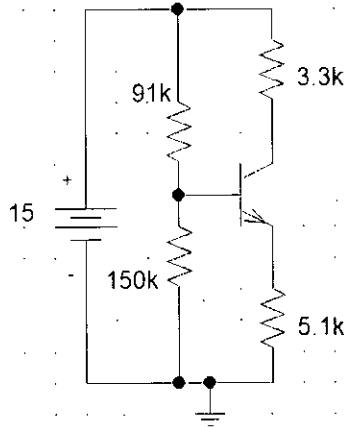


Fig. 2(a)

- (b) Design the circuit in Fig. 2(b) so that a current of 2 mA flows through the collector and a voltage of +0.5V appears at the collector. Given that $\beta = 100$, $v_{BE} = 0.8V$ at $i_C = 1mA$. Here $\pm 1.5V$ power supplies are used. (15)

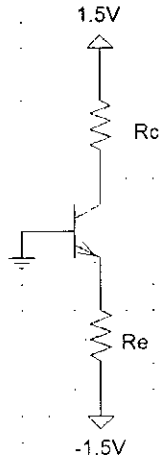


Fig. 2(b)

3. (a) Design the circuit in Fig. 3(a) so that the NMOS transistor operates at $I_D = 0.3$ mA and $V_D = +0.4V$. Here $V_t = 1$ V, $\mu_n C_{ox} = 60 \mu A/V^2$, $W/L = 120 \mu m/3 \mu m$. Here $\pm 2.5V$ power supplies are used. (15)

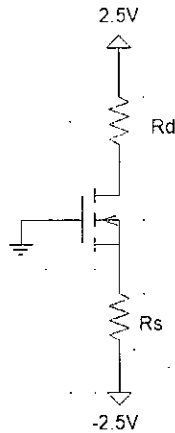


Fig. 3(a)

= 3 =

- (b) The NMOS and PMOS transistors in the circuit of Fig. 3(b) are matched with $kn' (Wn/Ln) = kp' (Wp/Lp) = 1 \text{ mA/V}^2$ and $V_{tn} = -V_{tp} = 1 \text{ V}$. Find the drain currents i_{DN} and i_{DP} and the voltage v_o for $v_i = 0 \text{ V}$. (15)

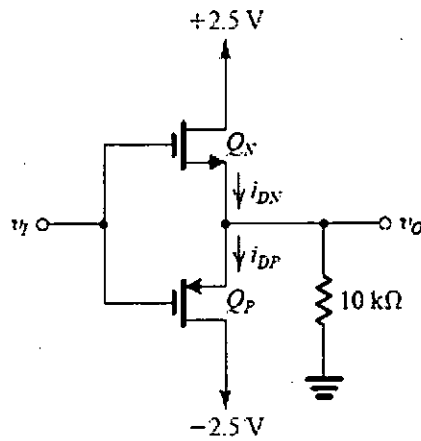


Fig. 3(b)

4. (a) The emitter follower in Fig. 4(a) is used to connect a source with $R_{sig} = 10 \text{ k}\Omega$ to a load $R_L = 1 \text{ k}\Omega$. The transistor is biased at $I = 5 \text{ mA}$, utilizes a resistance $R_B = 40 \text{ k}\Omega$, and has $\beta = 100$. Draw the small signal equivalent circuit. Find R_{in} . (15)

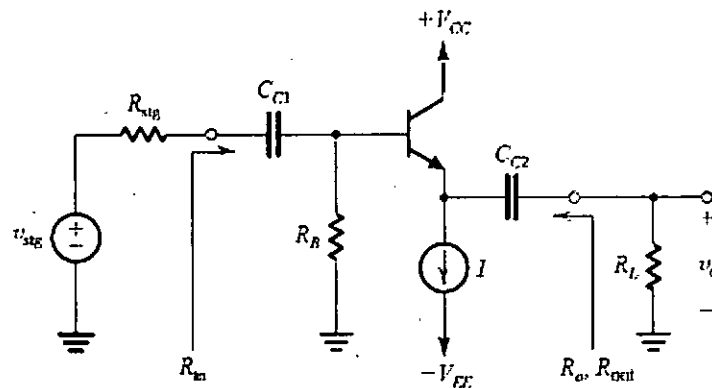


Fig. 4(a)

- (b) Design a BJT biasing circuit using "collector-base feedback resistor" configuration such that the emitter current is 1 mA and the feedback resistor has a voltage drop equal to 10% of V_{CC} where $V_{CC} = 15 \text{ V}$. Assume $\beta = 100$. Draw the biasing circuit with numerical values for the resistors and voltage source. (15)

SECTION - B

There are **FOUR** questions in this section. Answer any **THREE**

All the symbols have their usual meanings.

Assume reasonable values for missing data.

5. (a) Briefly explain how the open-circuit and short-circuit test for a synchronous generator are performed. How can the results obtained from these tests be used to determine an approximate value of the synchronous reactance X_S at a given field current? (15)

- (b) When a 100-MVA, 13.8 kV, 0.85 power factor lagging, four pole Y-connected synchronous generator was tested with a rated field current of 5 A, the armature current from the short-circuit test was found to be 950 A and the following open-circuit characteristic was obtained as shown in Fig. for Q. 5(b). When a dc voltage of 15V was applied to the two terminals, a current of 25 A was measured. Determine the values of armature resistance and synchronous reactance at rated test conditions. (15)

This generator now supplies rated load at 0.9 power factor lagging. Given that friction & windage losses are 4 MW and core losses amount to 3 MW, Find the efficiency of the synchronous generator.

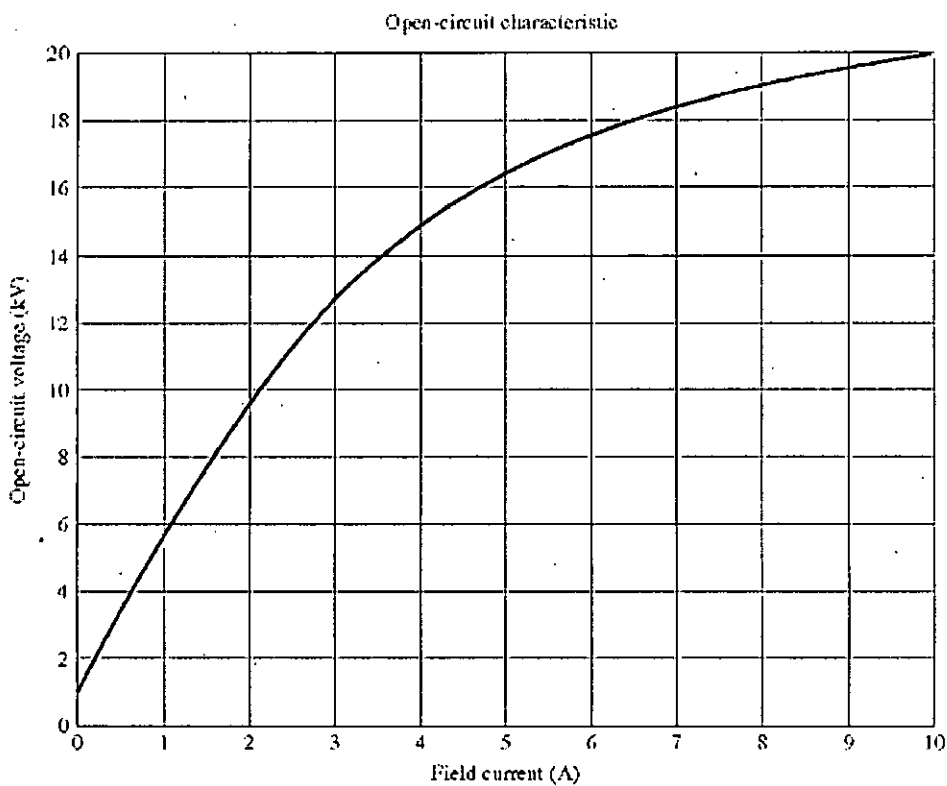


Fig. for Q. 5(b)

6. (a) A synchronous generator is supplying two loads as shown in Fig. for Q. 6(a). (15) With the help of a phasor diagram, explain what happens to the terminal voltage when Load 2 is disconnected.

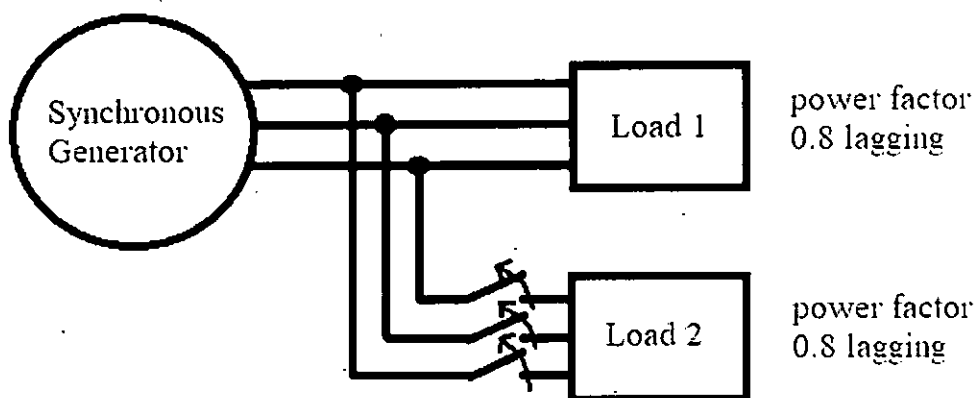


Fig. for Q. 6(a)

- (b) What conditions are to be met before a synchronous generator can be connected in parallel to another similar generator supplying power to a load? Explain how three-light-bulb method can be used to ensure some of these conditions. (15)
7. (a) From the phasor diagram of a synchronous motor undergoing change of field, derive the synchronous motor V curve. Explain in which region of the V curve the motor is operated in order to function as synchronous condenser. (18)
- (b) Describe the process of starting a synchronous motor using (i) external prime mover (ii) amortisseur windings. (12)
8. (a) Draw the torque-speed characteristic of a wound rotor induction motor. Explain the different methods of speed control of this motor, showing the impact on torque-speed characteristics in each case. (17)
- (b) A 50-kW, 460-V, 60-Hz, four-pole induction motor has a slip of 5 percent when operating at full load conditions. At full-load conditions, the friction and windage losses are 700 W, and some other stray losses occur inside the motor housing which totals 550 W. Find at this condition, (13)
- (i) The shaft speed
 - (ii) The output power
 - (iii) The load torque, τ_{load} and
 - (iv) The induced torque τ_{ind}