Bangladesh University of Engineering and Technology, Dhaka
L-1/T-2 B.Sc. Engineering Examinations: January 2020 (Online)
Sub: **CE 103** (Surveying)

Full Marks: 240 Time: 2 Hours

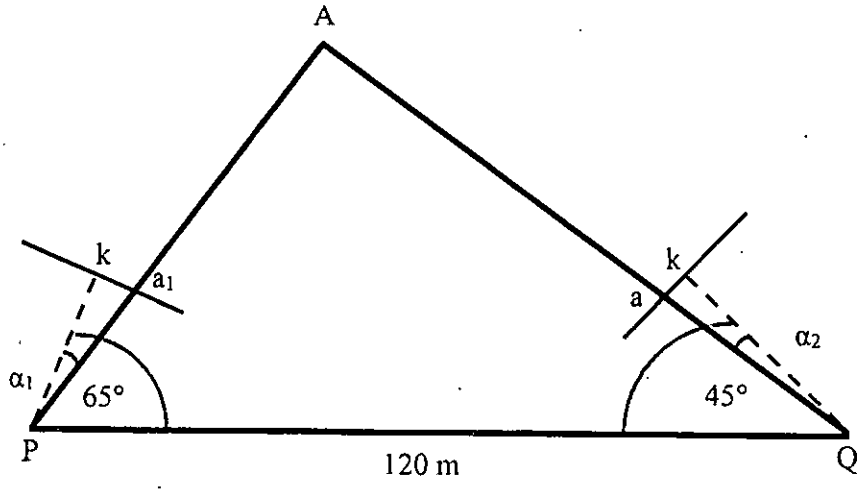
USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks

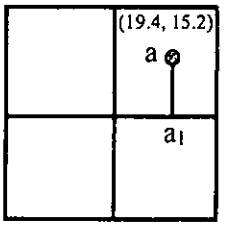
Section-A

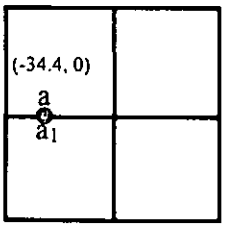
There are **FOUR** questions in this section. Answer any **THREE.**

1. (a) P and Q are two camera stations, 120 m apart as shown in Fig. 1(i). The camera axis makes an angle of 65° and 45° with the baseline at stations P and Q, respectively. The image coordinates of a point A are shown in Fig. 1(ii) and Fig. 1(iii). Calculate the distances PA and QA. What is the elevation of point A if the elevation of the instrument axis at station P is 130 m? The focal length of the camera is 160 mm. **(25)**



(i)





(ii) Photograph of point A taken at P (iii) Photograph of point A taken at Q

Fig. 1 for Question 1(a)

(b) The following reciprocal levels were taken with one level for two points A and B, 1550 m apart across a wide river:

Level at	Readings on	
	A	B
A	2.115	3.715
B	0.850	2.245

The error in the collimation adjustments of the level is -0.0045 m in 110 m. Calculate the true difference of level between A and B and the refraction. **(15)**

2. **(a)** In an aerial photogrammetry, the flying altitude was 2600 m above datum. The focal length of the camera lens was 20 cm. Two points A and B having elevations of 600 m and 400 m respectively above datum appear on a vertical photograph. The corrected photographic coordinates are as follows:

Point	Photographic coordinates	
	x (cm)	y (cm)
a	+2.65	+1.36
b	-1.92	+3.65

Determine the length of the ground line AB. **(15)**

(b) The following figures were extracted from a level field book, some of the entries being illegible owing to exposure to rain. Insert the missing figures and check your results. Recalculate all the figures by the 'rise' and 'fall' method. **(25)**

Station	B.S.	I.S.	F.S.	Rise	Fall	R.L.	Remarks
1	2.175					231.360	B.M. 1
2	1.550		X	0.020			
3		2.005			X		
4	X		1.860	X			
5	2.000		1.825		0.250		
6		X		X		231.155	B.M. 2
7	1.590		X	0.240			
8	2.765		2.000		X		
9			X	X		232.325	B.M. 3

3. (a) The altitude of the sun's lower limb at local apparent noon was measured to be 50°30′30″ to the south of zenith. Apply all necessary astronomical corrections (assume no instrumental corrections) to determine the true altitude of the sun. Hence, determine the latitude of the place of observation. Nautical Almanac gives the following information for

the time of observation: Declination of sun = 10°S, Semi-diameter of sun=16′0″, Horizontal parallax of sun=8.8″. Present neat sketch. **(22)**

(b) Determine the shortest distance between two points M (longitude=70°W, latitude 25°N) and N (longitude=80°E, latitude=10°S). Present neat sketch. **(18)**
[Given: *cosc = cosC sina sinb + cosa cosb*]

4. (a) Angular readings are taken from two theodolite stations A and B, at a horizontal distance of 60 m. apart. The vertical angles from A to the base and top of a tower at P is -10° (downward) and +12° (upward) respectively. The whole circle bearing of different lines are given below. Assume R.L. of instrument center at A to be 300 m. Determine the R.L. of ground at P and the tower height. Show neat sketch. **(20)**

Line	AB	AP	BP
W.C.B.	170°	100°	90°

(b) Determine the volume of earthwork for a 100 m long embankment using Trapezoidal method and Prismoidal correction. The embankment cross-section is a two-level section with following information: Formation level width = 20 m., Side slope = 1V:2H and Ground slope (along cross-section) = 1V:5H. The center-line data is given in the table below: **(20)**

Chainage (m)	0	50	100
Ground Level (m)	7.4	6.5	7.8
Formation Level (m)	10	10	10

[Given: $A = \left[\frac{r^2bh + s(0.5b)^2 + r^2sh^2}{r^2 - s^2}\right]$; $C_p = \frac{Lr^2s(h_1 - h_2)^2}{6(r^2 - s^2)}$]

SECTION-B: CE103

There are **FOUR** questions. Answer any **THREE** questions

<table>
<tr><th>No.</th><th>Questions</th><th>Marks</th></tr>
<tr><td>5.</td><td>a) A big pond obstructs the chain line AB. A line AL was measured on the left of line AB for circumventing the obstacle. Another line AM was measured on the right of AB. Points M, B, and L are on the same straight line. Find the distance AB, if AL = 901 m, AM = 1100 m, BL = 502 m and BM = 548 m.

b) Determine the length of a transition curve for a 4-lane rural highway with the following available information
i. Width of a single lane = 4 meter.
ii. Design Speed = 80 km/hr.
iii. emax =0.07; fmax =0.12</td><td>20

20</td></tr>
<tr><td>6.</td><td>a) Define magnetic declination. Magnetic bearing of a survey line, AB, as drawn in an old Map is S65°E. The map was drawn in 1910 when the declination was 1°30′E. What is the magnetic bearing of AB in 2020, if the rate of changes in magnetic declination was 0.2′ westward?

b) A and B are two stations whose independent coordinates are as follows:
<table>
<tr><th>Station</th><th>Latitude (m)</th><th>Departure (m)</th></tr>
<tr><td>A</td><td>7460</td><td>6010</td></tr>
<tr><td>B</td><td>6940</td><td>7720</td></tr>
</table>
A railway track is proposed for construction between stations C and D, which are not inter-visible. C is roughly south of B and D is roughly north of B. As C and D are not inter-visible, two perpendicular offsets, AC and BD, are drawn from stations A and B to the railway track CD. If AC = 104 m and BD = 60 m, determine the following
i) Bearing of CD
ii) Coordinates of C and D</td><td>20

20</td></tr>
<tr><td>7.</td><td>a) A parabolic vertical curve is to be set out connecting two uniform grades of +3.0 % and -3.5%. Chainage and reduced level of the point of vertical curve (PVC) are 1450 meters and 32.5 meters respectively. The rate of vertical curvature (k) is 20. Calculate the chainage and reduced levels of PVT and midpoint of the curve.

b) A 30-m chain is supported at the end only. Find the Normal Tension for the chain, if the calibrating pull is 120 N. Cross-section of the tape is 5 mm^2, weight of tape material = 0.08 N/mm^3, E = 200 GN/m^2. [Normal Tension is defined as the applied pull that equalizes the effect due to sag.]</td><td>20

20</td></tr>
</table>

No.	Questions	Marks
8.	a) As a field engineer, when would you prefer to use tachometric method of surveying over other methods and why?	10
	b) Discuss some of the possible reasons that may be responsible for errors in tacheometric surveys.	10
	c) The table below displays the field data for a tacheometric survey using a tacheometer fitted with an anallactic lens for a vertically held staff.	20

Instrument station	Height of instrument (meter)	Staff station	Vertical angle	Staff Readings
O	1.45	B	(-) 6° 30′	1.75, 1.95, 2.15
O	1.45	P	8° 30′	1.50, 1.65, 1.80
P	1.3	Q	10° 00′	1.89, 2.05, 2.21

Calculate the horizontal distances OP, OB and PQ. Also, calculate the elevations of Q, P and O if the elevation of B is 500 meter. Assume reasonable values for the tacheometric constants.

$$D = ks\cos^2\theta + C\cos\theta\,; V = ks\frac{sin2\theta}{2} + C\,sin\theta$$

L-1/T-2/CE Date: 13/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

B. Sc. Engineering Examinations January 2020

Sub: **PHY 151** (Structure of Matter, Electricity & Magnetism and Modern Physics)

Full Marks: 180 Time: 2 Hours

The figures in the margin indicate full marks. Symbols have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION-A

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

1. (a) Discuss Coulomb's law and Gauss's law in electrostatics. With an example, show that charge is conserved. Derive Coulomb's law from Gauss's law. [15]

   (b) Derive an equation for electric field E at a distance r from a line of charge with linear charge density λ. Write down the similar equation for magnetic field B for a current carrying conductor. [15]

2. (a) Define current and current density. Write down Ohm's law in macroscopic and microscopic form. Obtain an expression for drift velocity of an electron in an electrical conductor in terms of current density and the number of charge carriers. [15]

   (b) The copper windings of a motor have a resistance of 50 Ohms at 20 °C, when the motor is idle. After running for several hours the resistance rises to 58 Ohms. Calculate the temperature of the windings. [15]

3. (a) Write down Ampere's law. Derive an expression for B at a distance r from the center of a long cylindrical wire of radius R, where $r < R$. The wire carries a current i_o, distributed uniformly over the cross-section of the wire. [15]

   (b) A plastic disk of radius R has a charge q uniformly distributed over its surface. If the disk is rotated at an angular frequency ω about its axis, (i) show that the induction at the center of the disk is $B = \frac{\mu_0 \omega q}{2\pi R}$ (ii) the magnetic dipole moment of the disk is $\mu = \frac{\omega q R^2}{4}$ [15]

4. (a) Why the interatomic or intermolecular bonds exist in solid? Why the study of bonds in solid is important for a Civil Engineer? Distinguish between primary and secondary bonds. [12]

   (b) Distinguish between lattice energy and cohesive energy of an ionic crystal? Draw a typical unit cell of KCl crystal. Find out an expression for lattice energy of KCl crystal. [18]

SECTION-B

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

5. (a) Distinguish between tetragonal and orthorhombic crystal system. Draw the unit cell of various space lattices of these crystal systems. Calculate the number of atoms per unit cell in various space lattices in an orthorhombic crystal system. [15]

   (b)Suppose you are given a crystalline material whose atomic weight is M_x and atomic radius is p. Its crystalline nature is body centered cubic. Draw a typical unit cell of this crystal. Derive an expression for density of this crystal using above information. Calculate its packing factor. [15]

6. (a) Sketch [100], [110] and [111] crystal directions in a unit cell of a typical face centered cubic crystal. What is linear density of atoms? Compute and compare linear density values for these crystal directions for gold crystal. Atomic radius of gold atom is 0.144 nm. [15]

   (b) Sketch (100), (110) and (111) crystal planes in a unit cell of a typical body centered cubic crystal. What is planar density of atoms? Compute and compare planar density of atoms values for these planes for niobium (Nb) crystal. Atomic radius of Nb is 0.146 nm. [15]

7. (a) Using a suitable example show that relativistic mechanics is required in place of Newtonian mechanics to explain some physical phenomenon when moving frame moves at a speed comparable to the speed of light? Show that clock in the moving spaceship appears to go slower than the clock in the surface of the earth. [20]

   (b) An electron has a kinetic energy of 0.1 MeV. Find its speed according to classical and relativistic mechanics. [10]

8. (a) Why quantum theory is necessary to explain photoelectric effect and Compton scattering? Define Einstein's photoelectric effect equation. Show that it represents characteristic curve of different metal surfaces. [22]

   (b) Light of wavelength 3500 Å is incident on two metals A and B. Which metal will yield more photoelectrons if their work functions are 5 eV and 2 eV, respectively? [Given that 1 Å = 10^{-10} m] [8]

L-1/T-2/CE Date: 17/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2018-2019

Sub: **MATH 139**(Differential Equations and Statistics)

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)** A circuit has in series an electromotive force given by $E = 100sin40t$ V, a resistor of 10 Ω and an inductor of 0.5 H. If the initial current is 0, find the current at time $t > 0$. ($L\frac{di}{dt} + Ri = E$) **(15)**

(b) Solve the following differential equation **(15)**

$(2x + y + 3)\frac{dy}{dx} = x + 2y + 3$

2. Find the integrating factors of the following ODEs and solve them:

(a) $sinx\frac{dy}{dx} + 2y = tan^3\left(\frac{x}{2}\right)$ **(15)**

(b) $(y - xy^2)dx - (x + x^2y)dy = 0$ **(15)**

3. Solve the following ODEs:

(a) $(D^2 - 2D + 3)y = x^2 + cosx$ **(15)**

(b) $[x^2D^2 - 2xD + 2]y = x^2 + sin(5lnx)$ **(15)**

4. **(a)** Find the integral surface of the differential equation **(15)**

$2y(z - 3)p + (2x - z)q = y(2x - 3)$

which passes through the circle $z = 0,\ x^2 + y^2 = 2x$.

(b) Find the complete, singular (if exists) and general integral of **(15)**

$z^2(p^2z^2 + q^2) = 1$.

SECTION-B

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

5. **Solve the following**:

(a) $\left(D_x^2 - 5D_xD_y + 6D_y^2\right)z = \sin(2x - y)$ **(15)**

(b) $\left(D_x^2 - 3D_x + 3D_y - D_y^2\right)z = xy - 2e^{x-3y}$ **(15)**

6 **(a)** Following are the marks obtained by two students A and B in 6 tests of 100 marks each: **(17)**

Test number:	1	2	3	4	5	6
Marks obtained by A:	65	82	75	49	50	74
Marks obtained by B:	62	76	52	62	63	65

Compute: (i) Bowley's coefficient of skewness and comment on the shape of the marks obtained by B only. (ii) If the consistency of performance is the criterion for awarding a prize, who should get the prize?

(b) The mean monthly sale of the MKK chocolate bar in candy stores was 153.3 bars per store. After an advertising campaign, the mean monthly sale in 26 stores for a typical month increased to 158.4 and showed a standard deviation of 14.7. Was the advertising successful? Use a 5% level of significance. **(Necessary chart 1 is attached).** **(13)**

7 **(a)** In testing a certain kind of truck tire over a rugged terrain, it is found that 15% of the trucks fail to complete the test run without a blowout. Of the next 10 trucks tested, find the probability (using both binomial and poisson distribution) that (i) from 3 to 7 have blowouts; (ii) more than 6 have blowouts. **(14)**

(b) A west coast publishing company keeps accurate records of its monthly expenditure for advertising and its total monthly sales. For the first ten months of 2020, the records showed the following (note that units are in dollars): **(16)**

Advertising	(in thousands):	53	46	56	48	48	40
Sales	(in millions):	73	76	60	58	76	60

If the company plans to spend \$60,000 for advertising next month, what is their predicated sale? (Assume that all other factors can be neglected).

8 (a) The mark in an examination is assumed to be normally distributed. It is known that 10% of the students have marks under 40 and 15% exceed 75, what percentage of students have marks between 70 and 90? **(Necessary chart 2 is attached).** **(17)**

(b) A lot containing 8 components is sampled by a quality inspector; the lot contains 5 good components and 4 defective components. A sample of 4 is taken by the inspector. Find the expected value of the number of good components in this sample. **(13)**

Chart-1 for Q. 6

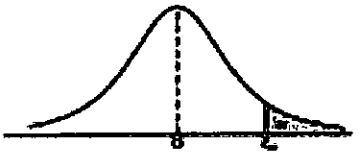


Table A.4 Critical Values of the t-Distribution

	α						
ν	0.40	0.30	0.20	0.15	0.10	0.05	0.025
1	0.325	0.727	1.376	1.963	3.078	6.314	12.706
2	0.289	0.617	1.061	1.386	1.886	2.920	4.303
3	0.277	0.584	0.978	1.250	1.638	2.353	3.182
4	0.271	0.569	0.941	1.190	1.533	2.132	2.776
5	0.267	0.559	0.920	1.156	1.476	2.015	2.571
6	0.265	0.553	0.906	1.134	1.440	1.943	2.447
7	0.263	0.549	0.896	1.119	1.415	1.895	2.365
8	0.262	0.546	0.889	1.108	1.397	1.860	2.306
9	0.261	0.543	0.883	1.100	1.383	1.833	2.262
10	0.260	0.542	0.879	1.093	1.372	1.812	2.228
11	0.260	0.540	0.876	1.088	1.363	1.796	2.201
12	0.259	0.539	0.873	1.083	1.356	1.782	2.179
13	0.259	0.538	0.870	1.079	1.350	1.771	2.160
14	0.258	0.537	0.868	1.076	1.345	1.761	2.145
15	0.258	0.536	0.866	1.074	1.341	1.753	2.131
16	0.258	0.535	0.865	1.071	1.337	1.746	2.120
17	0.257	0.534	0.863	1.069	1.333	1.740	2.110
18	0.257	0.534	0.862	1.067	1.330	1.734	2.101
19	0.257	0.533	0.861	1.066	1.328	1.729	2.093
20	0.257	0.533	0.860	1.064	1.325	1.725	2.086
21	0.257	0.532	0.859	1.063	1.323	1.721	2.080
22	0.256	0.532	0.858	1.061	1.321	1.717	2.074
23	0.256	0.532	0.858	1.060	1.319	1.714	2.069
24	0.256	0.531	0.857	1.059	1.318	1.711	2.064
25	0.256	0.531	0.856	1.058	1.316	1.708	2.060
26	0.256	0.531	0.856	1.058	1.315	1.706	2.056
27	0.256	0.531	0.855	1.057	1.314	1.703	2.052
28	0.256	0.530	0.855	1.056	1.313	1.701	2.048
29	0.256	0.530	0.854	1.055	1.311	1.699	2.045
30	0.256	0.530	0.854	1.055	1.310	1.697	2.042
40	0.255	0.529	0.851	1.050	1.303	1.684	2.021
60	0.254	0.527	0.848	1.045	1.296	1.671	2.000
120	0.254	0.526	0.845	1.041	1.289	1.658	1.980
∞	0.253	0.524	0.842	1.036	1.282	1.645	1.960

Chart-1 for Q. 6 continued

Table A.4 (continued) Critical Values of the t-Distribution

	α						
ν	0.02	0.015	0.01	0.0075	0.005	0.0025	0.0005
1	15.894	21.205	31.821	42.433	63.656	127.321	636.578
2	4.849	5.643	6.965	8.073	9.925	14.089	31.600
3	3.482	3.896	4.541	5.047	5.841	7.453	12.924
4	2.999	3.298	3.747	4.088	4.604	5.598	8.610
5	2.757	3.003	3.365	3.634	4.032	4.773	6.869
6	2.612	2.829	3.143	3.372	3.707	4.317	5.959
7	2.517	2.715	2.998	3.203	3.499	4.029	5.408
8	2.449	2.634	2.896	3.085	3.355	3.833	5.041
9	2.398	2.574	2.821	2.998	3.250	3.690	4.781
10	2.359	2.527	2.764	2.932	3.169	3.581	4.587
11	2.328	2.491	2.718	2.879	3.106	3.497	4.437
12	2.303	2.461	2.681	2.836	3.055	3.428	4.318
13	2.282	2.436	2.650	2.801	3.012	3.372	4.221
14	2.264	2.415	2.624	2.771	2.977	3.326	4.140
15	2.249	2.397	2.602	2.746	2.947	3.286	4.073
16	2.235	2.382	2.583	2.724	2.921	3.252	4.015
17	2.224	2.368	2.567	2.706	2.898	3.222	3.965
18	2.214	2.356	2.552	2.689	2.878	3.197	3.922
19	2.205	2.346	2.539	2.674	2.861	3.174	3.883
20	2.197	2.336	2.528	2.661	2.845	3.153	3.850
21	2.189	2.328	2.518	2.649	2.831	3.135	3.819
22	2.183	2.320	2.508	2.639	2.819	3.119	3.792
23	2.177	2.313	2.500	2.629	2.807	3.104	3.768
24	2.172	2.307	2.492	2.620	2.797	3.091	3.745
25	2.167	2.301	2.485	2.612	2.787	3.078	3.725
26	2.162	2.296	2.479	2.605	2.779	3.067	3.707
27	2.158	2.291	2.473	2.598	2.771	3.057	3.689
28	2.154	2.286	2.467	2.592	2.763	3.047	3.674
29	2.150	2.282	2.462	2.586	2.756	3.038	3.660
30	2.147	2.278	2.457	2.581	2.750	3.030	3.646
40	2.123	2.250	2.423	2.542	2.704	2.971	3.551
60	2.099	2.223	2.390	2.504	2.660	2.915	3.460
120	2.076	2.196	2.358	2.468	2.617	2.860	3.373
∞	2.054	2.170	2.326	2.432	2.576	2.807	3.290

Chart-2 for Q. 8

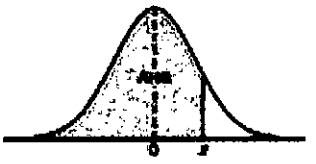


Table A.3 Areas under the Normal Curve

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
–3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
–3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
–3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
–3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
–3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
–2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
–2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
–2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
–2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
–2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
–2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
–2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
–2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
–2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
–2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
–1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
–1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
–1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
–1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
–1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
–1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
–1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
–1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
–1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
–1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
–0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
–0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
–0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
–0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
–0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
–0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
–0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
–0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
–0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
–0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Chart-2 for Q. 8 continued

Table A.3 (continued) Areas under the Normal Curve

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9796	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

L-1/T-2/CE Date:-20/01/2021

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B.Sc. Engineering Examinations- January 2020

Sub: **HUM 185** (English)

Full Marks: 120 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 **Q. No.1** and **any TWO** from the rest.

1. Answer **any one** of the following: (20)

   a) How did Katherine Mansfield recount the class distinction between the Sheridans and their poor neighbours in "The Garden Party"? Elucidate.

   b) Who in your opinion won the bet between the Banker and the Lawyer in Anton Chekhov's "The Bet"? Justify your answer.

2. (a) Explain with reference to the context **any one** of the following: (10)

   i. "His readings suggested a man swimming in the sea among the wreckage of his ship, and trying to save his life by greedily clutching first at one spar and then at another."

   ii. "They were the greatest possible eyesore, and they had no right to be in that neighbourhood at all."

   (b) Answer **any two** of the following: (10)

   i. How did Matilda's life change after she lost the diamond necklace?

   ii. What do the lilies signify in "The Garden Party"?

   iii. What are the terms and conditions of the bet in the short story "The Bet"?

3. Write a dialogue between two friends about the life of a freshman at BUET. (20)

4. Write a précis of the following passage with a suitable title: (20)

The digital divide metaphor became popular in the mid-1990s, when the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce published a research report on Internet diffusion among Americans. The report revealed widespread inequalities in national ICT access, with migrant or ethnic minority groups and older, less-affluent people living in rural areas with low educational attainments being especially excluded from Internet services. That pattern was confirmed by follow-up surveys by the NTIA, which indicated also an initial gender gap in favour of men. Although diffusion rates of the Internet subsequently rose in all groups, subsequent studies showed a perpetuating digital divide both in the United States and abroad. Some common characteristics emerged. In single nation-states, access to and usage of computer technology was stratified by age, education, ethnicity, race, family structure, gender, income, occupation, and place of residence. In that way, affluent young urban men and women with high levels of education who lived in small families with children were the greatest adopters of the new media. Such people were most likely to possess ICTs (material or physical access), the experience and skills necessary to use the Internet (skills access), and sufficient free time to spend online (usage access). Here, Internet usage among advantaged groups includes searching for information to address professional or political interests. On the contrary, many people from less-advantaged groups have been shown to lack those basic navigation skills and to prefer entertainment on the Internet instead. On the global level, additional factors such as per capita gross domestic product, international trade volume, degree of democratization, deregulation of the telecommunications market, density of communication infrastructure, and investments in research and development also influence Internet diffusion. Thus, industrial societies are more prone to implement new technologies than less-developed countries. For example, by 2012 the greatest intensity of national ICT access and usage had

occurred in South Korea, Japan, and northern Europe. Over time, the global digital divide has remained relatively stable. Yet, in single nation-states some gaps in ICT access and usage have slowly begun to fade. The early differences between men and women and between rural and urban areas of Western residences subsided, possibly due to extended telecommunications networks, lowered entry barriers, and additional ICT experiences at work. Other initial inequalities caused by factors such as age, education, ethnicity and race and income however, continued.

SECTION – B

There are **FOUR** questions in this section. Answer **Q. No. 5** and **any TWO** from the rest.

5. Read the following passage carefully and answer the questions that follow: (20)

Philosophy of Education is a label applied to the study of the purpose, process, nature and ideals of education. It can be considered a branch of both philosophy and education. Education can be defined as the teaching and learning of specific skills, and the imparting of knowledge, judgment and wisdom, and is something broader than the societal institution of education we often speak of.

Many educationalists consider it a weak and woolly field, too far removed from the practical applications of the real world to be useful. But philosophers dating back to Plato and the Ancient Greeks have given the area much thought and emphasis, and there is little doubt that their work has helped shape the practice of education over the millennia.

Plato is the earliest important educational thinker, and education is an essential element in "The Republic" (his most important work on philosophy and political theory, written around 360 B.C.). In it, he advocates some rather extreme methods: removing children from their mothers' care and raising them as wards of the state, and differentiating children suitable to the various castes,

the highest receiving the most education, so that they could act as guardians of the city and care for the less able. He believed that education should be holistic, including facts, skills, physical discipline, music and art. Plato believed that talent and intelligence is not distributed genetically and thus is be found in children born to all classes, although his proposed system of selective public education for an educated minority of the population does not really follow a democratic model.

Aristotle considered human nature, habit and reason to be equally important forces to be cultivated in education, the ultimate aim of which should be to produce good and virtuous citizens. He proposed that teachers lead their students systematically, and that repetition be used as a key tool to develop good habits, unlike Socrates' emphasis on questioning his listeners to bring out their own ideas. He emphasized the balancing of the theoretical and practical aspects of subjects taught, among which he explicitly mentions reading, writing, mathematics, music, physical education, literature, history, and a wide range of sciences, as well as play, which he also considered important.

During the Medieval period, the idea of Perennialism was first formulated by St. Thomas Aquinas in his work "De Magistro". Perennialism holds that one should teach those things deemed to be of everlasting importance to all people everywhere, namely principles and reasoning, not just facts (which are apt to change over time), and that one should teach first about people, not machines or techniques. It was originally religious in nature, and it was only much later that a theory of secular perennialism developed.

During the Renaissance, the French skeptic Michel de Montaigne (1533 - 1592) was one of the first to critically look at education. Unusually for his time, Montaigne was willing to question the conventional wisdom of the period, calling into question the whole edifice of the educational system, and the implicit assumption that university-educated philosophers were necessarily wiser than uneducated farm workers, for example.

Questions:

a. Why is education called a weak field?

b. Comment on the nature of education as claimed by Plato.

c. What is the main goal of education according to Aristotle?

d. What is perennialism?

6. You are the Director of Loan Disbursement, Brac Bank. Tata Motors, a long-time client, has applied for a loan of eighty million taka. Write a refusal letter to the Manager of Tata Motors. (Full Block) (20)

7. Write a short composition on **any one** of the following topics: (20)

   a. Effects of Digital Addiction

   b. Online Learning during the COVID-19 Pandemic

8. Critically discuss the front matters of a report. (20)

L-1/T-2/CE **Date: 24/01/2021**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B.Sc. Engineering Examination 2018-19

Sub: **EEE 165** (Basic Electrical Technology)

Full Marks: 180 Time 2 Hours

The Figures in the margin indicate full marks

USE SEPARATE SCRIPTS FOR EACH SECTION

There are 6 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) Determine V and I_o in the circuit of Fig. 1(a). (15)

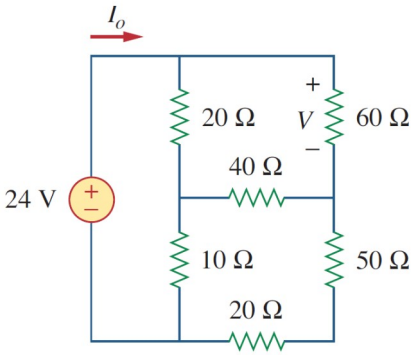


Fig. 1(a)

(b) Calculate v_1 and v_2 in the circuit of Fig. 1(b) using nodal analysis. (15)

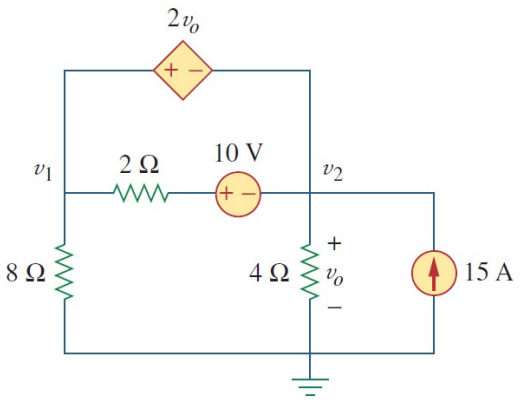


Fig.1(b)

2. (a) Obtain v_0 in the circuit of Fig. 2(a) using source transformation. (10)

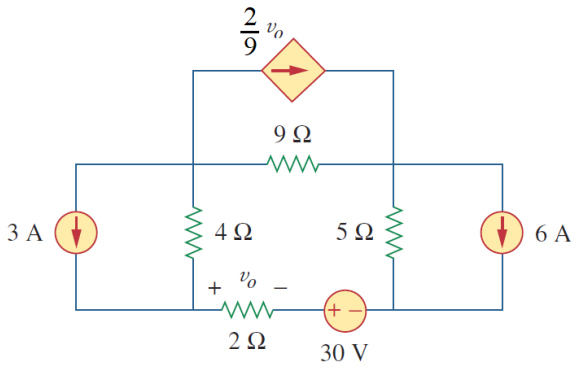


Fig. 2(a)

(b) Determine the value of the load resistance R_L to be connected at terminals a-b of the circuit in Fig. 2(b), for which maximum power is transferred. What is the value of this maximum power? (20)

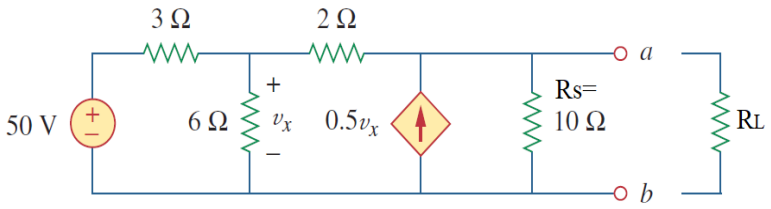


Fig. 2(b)

3. (a) A 100-kVA, 8000/277-V distribution transformer has the following resistances and reactances: (15)

$R_P = 5$ $X_P = 6\ \Omega$

$R_c = 50\ k\Omega$ $X_M = 10\ k\Omega$

$R_s = 0.005\ \Omega$ $X_s = 0.006\ \Omega$

The excitation branch impedances are given referred to the high-voltage side of the transformer.

i) Find the equivalent circuit of this transformer referred to the low-voltage side.

ii) Assume that this transformer is supplying rated load at 277 V and 0.85 PF lagging. What is this transformer's input voltage?

(b) Answer the following short questions – (15)

i) Explain the presence of high frequency components in magnetization current.

ii) In the model of a real transformer, why is the excitation branch connected in parallel to the ideal transformer?

iii) Open circuit and Short circuit tests are performed on different sides/windings of a transformer. Mention the reasoning.

4 (a) Draw complete conduit layout, switch-board connection diagram, distribution board connection diagram for the Fittings & Fixture Layout of Fig 4(a). Assume K_1 as a two way switch driven appliance where switchboards 1 and 2 are used to drive it. (20)

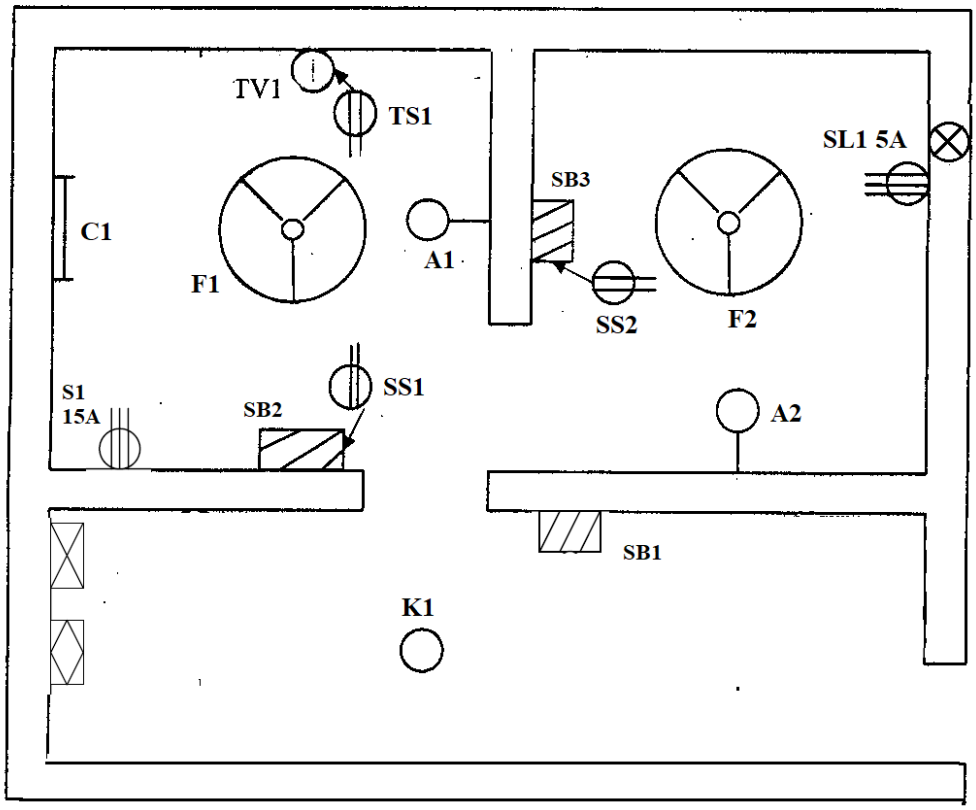


Fig 4(a)

(b) The charge stored in a 10 μF capacitor is plotted in Fig. 4(b). Sketch the corresponding voltage and current. (10)

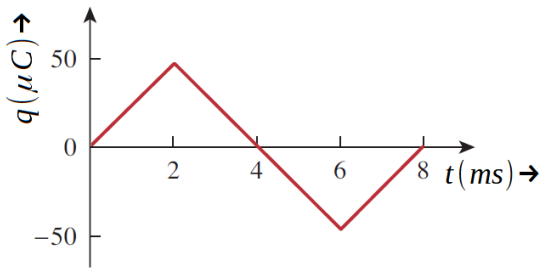


Fig. 4(b)

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) For the circuit shown in Fig. for Q. 5(a), $R_1 = 80\Omega$, $|V_1| = 45V$, $|V_s| = 125V$, $|V_o| = 110$ V. Voltage measurements are taken with an AC voltmeter when the circuit is at steady state and operating at 60 Hz frequency. Find the values of R_2 and L. (15)

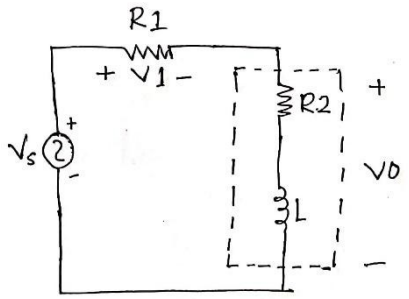


Fig. for Q. 5(a)

(b) One of the line voltages of a balanced Y connected source is $V_{ab} = 240\angle 20°$. If the source is connected to a delta connected load of $20\angle 40°$, find the line currents and phase currents. Assume abc sequence. (15)

6. (a) For the circuit shown in Fig. for Q. 6(a), find the frequency for which input and output voltages are in phase. [Find your result in terms of circuit components C, R, R_1, R_2] (15)

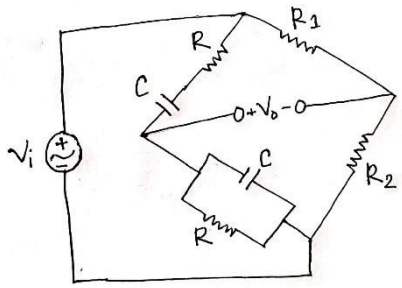


Fig. for Q. 6(a)

(b) The device shown in Fig. for Q. 6(b) is represented by a Norton equivalent circuit. When a resistor having an impedance of 5 kΩ is connected across the device, then the value of V_o is 5-*j*15 V. When a capacitor having an impedance of - *j*3 is connected across the device, the value of I_0 is 4.5 - *j*6 mA. Find the Norton current I_N and the Norton impedance Z_N. (15)

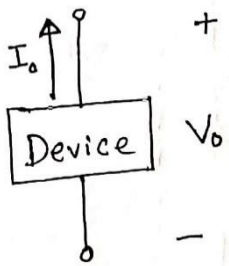


Fig. for Q. 6(b)

7. (a) Determine i_o for the circuit in Fig. Q. 7(a) (15)

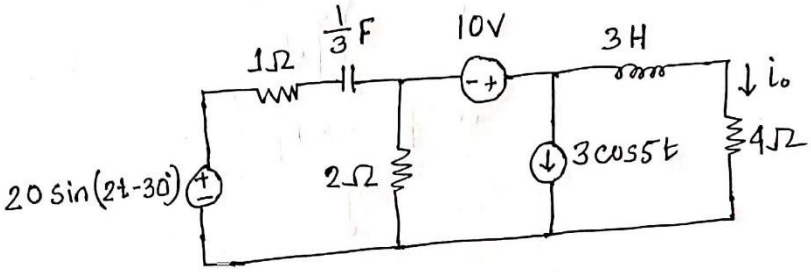


Fig. for Q. 7(a)

(b) The unknown network shown in Fig. for Q. 7(b) operates at 0.8 lagging power factor. When a capacitor C is added in parallel to this network, the capacitor draws a current of $j73.3$ A and improves the power factor to 0.95 lagging. Find: (15)

(i) The value of the capacitance C.

(ii) The nature of the passive network and values of the circuit parameters.

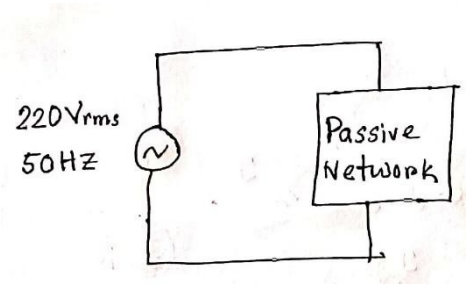


Fig. for Q. 7(b)

8 (a) A 60kW, 430V, 60Hz, two-pole induction motor has a slip of 10 percent when operating at full-load conditions. At full-load conditions, the friction and windage losses are 500 W, and the core losses are 800 W. Find the following values for full-load conditions: 15

(i) The shaft speed n_m

(ii) The output power in watts

(iii) The load torque τ_{load} in Newton-meters

(iv) The induced torque τ_{ind} in Newton-meters

(v) The rotor frequency in hertz.

(b) A 480V, 50Hz, six-pole, Y-connected induction motor is rated at 30 hp. The equivalent circuit parameters are: 15

$R_1 = 0.18\ \Omega$, $X_1 = 0.75\ \Omega$

$R_2 = 0.25\ \Omega$, $X_2 = 1.25\ \Omega$, $X_M = 30\ \Omega$

$P_{F\&W} = 600$ W, $P_{misc} = 200$ W, $P_{core} = 320$ W

For a slip of 0.05, find

(i) The line current I_L

(ii) The stator power factor

(iii) The rotor power factor

(iv) The rotor frequency

(v) The stator copper losses P_{SCL}

(vi) The air-gap power P_{AG}

(vii) The power converted from electrical to mechanical form P_{conv}

(viii) The induced torque τ_{ind}

(ix) The load torque τ_{load}.