

SECTION – A

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

1. (a) With a neat sketch, describe the method of chaining between two points that are not inter-visible. Note that, from suitable intermediate points both points are visible. (13)
 - (b) Write Short notes 'Gunter's Chain', 'Optical Square' and Reconnaissance Survey'. (15)
 - (c) A survey line PQR crosses a river in an inclined direction. From point P, Q and R are on the near and distant banks of the river respectively. A particular point O is 60 meters away from Q, while measured perpendicularly to PQ. Bearings of R and P are 320° and 230° respectively from O. If PQ is 30 meter, determine the length of QR. (6)
 - (d) To test the line of collimation of a Dumpy level, the instrument was placed at C, exactly at mid-way between two points A and B, 200 ft apart. The staff readings at A and B were 4.62 ft and 2.86 ft respectively. The instrument was then placed at D, 50 ft behind B, in the same straight line and the staff readings at A and B were 4.84 ft and 2.98 ft respectively. Find the correct staff readings at A and B from level station D. (12 $\frac{2}{3}$)
2. (a) Classify Photogrammetry and briefly describe two types of Photogrammetry. What are the requirements of an aerial camera? (6+3)
 - (b) State at least 6 (six) purpose of aerial surveying. Write short notes on Crab and Drift with proper illustrations. (3+12)
 - (c) An area is 18 miles long and 12 miles wide. It is to be photographed with a lens having 9 inch focal length for the purpose of compiling a topographic map. The photograph size is 8 inch by 8 inch. The average scale is to be 1 : 6000 effective at an average elevation of 500 ft above sea level. The overlaps of the images are to be at least 60% and sidelaps to be at least 20%. Determine, (i) Flying height, (ii) Exposure interval rounded to integral number of seconds, (iii) Number of flight lines and (iv) Total number of Photographs. (16)
 - (d) The top of Kutubdia light house is visible just above the horizon from a certain place when the height of the observer is 50 ft from sea-level. The distance of the light house from the observer is 20 miles. Calculate the height of the light house. (6 $\frac{2}{3}$)

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3. (a) Define contour interval. Briefly describe the considerations in selecting proper contour interval. (10 2/3)

(b) Define the following terms of Astronomical Surveying (answer any three)
 (i) Observer's Meridian, (ii) Right Ascension, (iii) Azimuth and (iv) Ecliptic. (12)

(c) Find the shortest distance between A ($\phi = 140^\circ\text{E}$, $\theta = 20.5^\circ\text{S}$) and B ($\phi = 70^\circ\text{E}$, $\theta = 20.5^\circ\text{S}$). Now find the distance between these two points along a line of constant latitude. (10+4)

(d) Draw a neat sketch showing the Declination (δ) of a star and the Latitude (θ) of the place. Now prove that for the star to be a circumpolar star, Declination (δ) should be greater than co-latitude ($90^\circ - \theta$) of that place. (5+5)

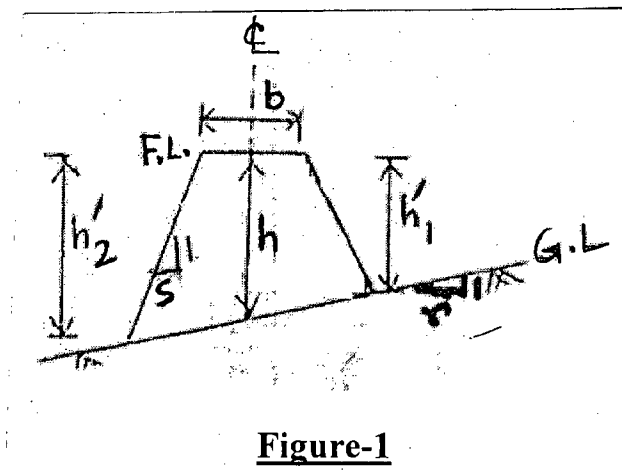
4. (a) Write short notes on two major Astronomical Corrections. (10 2/3)

(b) Draw a neat sketch of a tilted photograph and identify (i) Nadir point, (ii) Angle of tilt, (iii) Principle line, (iv) Swing, (v) Azimuth of Principal plane, (vi) Isocentre and (vii) Horizon point. (14)

(c) Two theodolite stations A and B are 100 ft apart, while bearing of line AB, measured from A is 90° . Bearing of a particular tower from point A and B are $340^\circ 20'$ and $310^\circ 30'$ respectively. Vertical angle at the top of the tower measured from A is $26^\circ 12'$. Staff reading on B.M. when the instrument is at A, is 1.95 m. First, draw a neat plan view showing the theodolite stations and the horizontal angles only. Then, determine the elevation of the top of the tower if that of B.M. is 100.85 meters. (3+9)

(d) What are the basic assumptions in computing the volume using cross-sections? Show that for the cross section of a two-level section shown in figure-1, area is computed by the following formula. (3+7)

$$\text{Area} = \left[\frac{r^2bh + s(0.5b)^2 + r^2sh^2}{r^2 - s^2} \right]$$



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SECTION – B

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

5. (a) Following observations were taken from two traverse stations by means of a tacheometer fitted with an anallactic lens. (20)

Inst. station	Staff station	Height of inst.	Bearing	Vertical angle	Staff readings
A	C	1.38 m	226°30'	+10°12'	0.765, 1.595, 2.425
B	D	1.42 m	84°45'	- 12°30'	0.820, 1.840, 2.860

Co-ordinates (in meter) of station A: 212.3 N, 186.8 W

Co-ordinates (in meter) of station B: 102.8 N, 96.4 W

Complete the length and gradient of the line CD, if B is 6.50 m higher than A. Staff was kept vertical during the survey.

- (b) What is closing error in traverse surveying? Show this error in a neat sketch. (5²/₃)

- (c) The following bearings were taken in running a compass traverse: (16)

Line	F.B	B. B
AB	124°30'	304°30'
BC	68°15'	246°0'
CD	310°30'	135°15'
DA	200°15'	17°45'

At what stations do you suspect local attraction? Find the correct bearings of the lines and also compute the included angels.

- (d) What are the requirements of a magnetic needle? (5)

6. (a) What is magnetic declination? In an old map, a line AB was drawn to a magnetic bearing of 5°30', the magnetic declination at the time being 1° East. To what magnetic bearing should the line be set now if the present magnetic declination is 8°30' East? (2+3²/₃=5²/₃)

- (b) Describe briefly any 3 methods of plane tabling with proper illustrations. (3×6=18)

- (c) A four sided traverse ABCD has the following lengths and bearings: (15)

Line	Length (m)	Bearing
AB	500	Roughly East
BC	245	178°
CD	Not obtained	270°
DA	216	10°

Find the exact bearing of the side AB.

- (d) Describe briefly the graphical method of balancing the traverse with proper illustrations. (8)

7. (a) Define and classify “Remote Sensing” What do you mean by “Nuclear Detection System (NDS or NUDET)? State five applications of GIS. (5+5+4)

- (b) “For accurate determination of 3D positions by GPS, 4 satellites must be in view of the receiver”. Explain. (10)

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- (c) Differentiate between linear method and angular method of setting out curves. (4 $\frac{2}{3}$)
- (d) A crest vertical curve is to be set out with initial grade of 1.2% and final grade of - 3.0%. The chainage and reduced level of point of intersection (PVI) are 1500 m and 30 m respectively. The rate of vertical curvature is 39. Calculate the chainage and reduced levels of PVC, PVT and midpoint of the curve. (12)
- (e) Why vertical curves are used in roadways or highways? Why parabolic curve is used as vertical curve? (3+3=6)
8. (a) Write down the functions of transition curves? (6 $\frac{2}{3}$)
- (b) Derive the equation of an ideal transition curve and hence derive the expression for shift, $S = \frac{L^2}{24R}$ with necessary sketch. (Symbols have their usual meaning). (7+7=14)
- (c) Based on the following information, calculate necessary data for setting out the transition and circular curve in the field. Deflection angle, $\Delta = 48^\circ$, Design speed, $V = 80$ km/h, Maximum rate of super-elevation, $e_{\max} = 0.12$, Max. rate of change of radial acceleration = 0.2 m/sec^3 , chainage of PI = 840 m.
Tabulate the data for one transition curve and half of the circular curve using deflection angle method. Use maximum peg interval = 20m. (18)
- (d) Briefly explain the procedure for setting out the combined transition and circular curves by deflection angle method. (8)
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BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

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

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Explain the terms (i) space lattice, (ii) basis, (iii) unit cell, and (iv) lattice parameters of a unit cell. (12)
- (b) Write down the lattice parameters for (i) orthorhombic, (ii) cubic and hexagonal crystal systems. Draw the unit cells for various space lattices in the above mentioned crystal systems. (18)
- (c) What is the crystalline nature of gold (*Au*) metal? Draw a typical unit of gold crystal. The atomic radius of gold crystal is 0.1750 nm . Calculate its density. (5)

2. (a) What is packing factor of a crystal? Explain the crystal structure of *NaCl* crystal. Calculate the packing factor for *NaCl* crystal if the ionic radii of *Cl* and *Na* are 0.187 and 0.097 nm , respectively. Why the packing factor of *NaCl* crystal is different from an ideal face centered cubic crystal? (18)
- (b) Draw a schematic diagram of an X-ray diffractometer. Deduce Bragg's law. Draw a typical X-ray diffraction pattern for body centered cubic polycrystalline iron with their Miller indices. (17)

3. (a) What do you mean by defects in crystal? Describe briefly various types of defects that exist in solids. (12)
- (b) Distinguish between lattice energy and cohesive energy of an ionic crystal? Derive an expression for lattice energy for a typical ionic crystal. (15)
- (c) The experimental density of single crystal *Al* is 2.697 g/cm^3 . The lattice constant for face centered cubic *Al* crystal is 0.4049 nm . If the discrepancy between calculated and the experimental density arises as a result of vacancies, (i) what fraction of atom is absent? (ii) how many vacancies are there per cm^3 ? (8)

4. (a) Define electric field strength and electric potential and also find the relation between them. (6)
- (b) Calculate (i) the electric field intensity due to an electric dipole, and (ii) electric potential due to an electric quadrupole. (21)

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(c) Three equal charges of $+12\text{nC}$ are located at the corners of an equilateral triangle whose sides are 12 cm long. Find the electric potential at the centre of the base of the triangle and also calculate their mutual electric potential energy. (8)

SECTION – B

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

5. (a) What is dielectric material? Why dielectric slab is used in a charged parallel plate capacitor? Explain it in terms of atomic view. (10)
- (b) Find an expression for charging and discharging of a capacitor through a resistance for a constant emf. (17)
- (c) In a RC circuit, a $100\ \mu\text{F}$ capacitor is connected through a $400\ \Omega$ resistor to 30 V battery. (i) What is the time constant of the circuit? (ii) How long does it take for the charge on a capacitor plate to reach $0.9\ q_0$? (8)
6. (a) Obtain an expression for the torque acting on a current carrying coil placed in a magnetic field. Explain magnetic dipole and magnetic dipole moment. (17)
- (b) State Ampere's law for magnetic field. Deduce an expression of magnetic field at the centre of a toroid. (12)
- (c) Two long parallel wires are 15 cm apart in air and carry currents of 10 A and 2 A, respectively. Find the force of attraction on each meter length of wire if the currents are (i) in the same direction and (ii) in opposite direction. (6)
7. (a) What is the main drawback of Galilean transformation and how it was overcome in Lorentz transformation? (12)
- (b) There are two observers in two different frames of reference. Each of them carries identical cricket bat held along the direction of their relative motion. Each one measures, other's bat is shorter. Explain the reason for such paradox. (10)
- (c) Explain the relativistic energy of a body of mass 'm'. Find the momentum of an electron whose kinetic energy equals its rest energy of 511 KeV. (13)
8. (a) Why do you need to consider particle property of light to explain the photoelectric effect and Compton Scattering? (8)

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Contd ... Q. No. 8

(b) An X-ray of wavelength λ is scattering by an electron. Find the expression for wavelength shift during its scattering and hence explain the head on and glancing collision between the photon and electron. (20)

(c) Define half life and mean life of a radioactive substance. Considering radon $\left[\begin{matrix} 222 \\ 86 \end{matrix} \text{Rn} \right]$ gas as a radioactive substance whose half life is 3.82 days, calculate the radioactive decay constant and the mean life of radon. (7)

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

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

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Solve the following differential equations:

(i) $(1 + y^2) + \left(x - e^{\tan^{-1}y}\right) \frac{dy}{dx} = 0$ (11)

(ii) $x^3 \frac{dy}{dx} - x^2 y + y^4 \cos x = 0$ (12)

(b) Air at temperature 200 K is passed over a substance at 300 K. The temperature of the substance cools down to 260 K in 30 minutes. Assuming that the rate at which a substance cools in moving air is proportional to the difference between the temperature of the substance and that of the air, find after what time the temperature of the substance would be 240 K. (K stands for Kelvin). (12)

2. (a) Find the integrating factor and solve the following equation: (12)

$(xy^2 + 2x^2y^3)dx + (x^2y - x^3y^2)dy = 0$

- (b) Solve the following differential equations:

(i) $xy(p^2 + 1) = (x^2 + y^2)p$ (11)

(ii) $p^3 - 2xy p + 4y^2 = 0$ (12)

3. Solve the following higher order differential equations:

(i) $(D^2 - 2D + 5)y = e^x \cos 2x + \sin x$. (10)

(ii) $(D^4 - 1)y = x^2 \sin x$. (15)

(iii) $(x^2 D^2 - 3xD + 5)y = x^2 \sin \log x$. (10)

4. (a) Find the integral surface of
- $(x + y)(xp - yq) = (x - y)z$
- which passes through the line
- $z = 1, x = y$
- . (11)

(b) Find the complete integral of $2x^4 p^2 - yzq - 3z^2 = 0$ (11)

(c) Use Charpit's method to find the complete integral of $(p^2 + q^2)y = qz$. Also find the singular integral (if exists). (13)

MATH 139

SECTION – B

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

5. (a) Find the surface satisfying $r - 2s + t = 6$ and touching the surface $z = xy$ along its section by the plane $y = x$. (12)

(b) Solve the following:

(i) $xu_{xy} + yu_{yy} + u_y = 10x^3y$ (12)

(ii) $x^2 \frac{\partial^2 z}{\partial x^2} - y^2 \frac{\partial^2 z}{\partial y^2} + x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y} = \ln x$ (11)

6. (a) Lives of two models of refrigerators in a survey are as follows: (17)

Life (Number of years)	Number of refrigerators	
	Model A	Model B
0-2	5	2
2-4	16	7
4-6	13	12
6-8	7	19
8-10	5	9
10-12	4	1

Which model has greater uniformity?

(b) Calculate the first four moments about the origin from the following data.

x:	0	1	2	3	4	5	6	7	8
f:	5	10	15	20	25	20	15	10	5

Also calculate the values of β_1 and β_2 and comment on the nature of the distribution. (18)

7. (a) Prove that the coefficient of correlation lies between -1 and $+1$. Calculate the coefficient of correlation from the following data and comment on the result. (17)

x:	2135	2547	2364	2293	2161
y:	76	88	82	79	75

(b) Explain the terms level of significance and degrees of freedom. On an examination given to students at a large number of different schools, the mean grade was 74.5 and the standard deviation was 8. At one particular school where 200 students took the examination, the mean grade was 75.9. Discuss the significance of this result at the 0.01 level from the viewpoint of (i) a one-tailed test and (ii) a two-tailed test. (necessary chart 1 is attached) (18)

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8. (a) A problem of statistics is given to three students A, B and C whose chances of solving it are $\frac{1}{2}$, $\frac{3}{4}$ and $\frac{1}{4}$ respectively. What is the probability that the problem will be solved? (10)

(b) The incidence of occupational disease in an industry is such that the workmen have 25% chance of suffering from it. What is the probability that the out of 6 workmen 4 or more will contract disease? (12)

(c) If the diameters of ball bearings are normally distributed with mean 6.14 mm and standard deviation 0.025 mm, determine the percentage of ball bearings with diameters (i) between 6.10 and 6.18 mm inclusive (ii) greater than 6.17 mm (iii) less than 6.08 mm (necessary chart 2 attached). (13)

Level of significance, α	0.10	0.05	0.01	0.005	0.002
Critical values of z for one-tailed tests	-1.28 or 1.28	-1.645 or 1.645	-2.33 or 2.33	-2.58 or 2.58	-2.88 or 2.88
Critical values of z for two-tailed tests	-1.645 and 1.645	-1.96 and 1.96	-2.58 and 2.58	-2.81 and 2.81	-3.08 and 3.08

Chart 1 for Q no 7(b)

Md. Shafiqul Kabir

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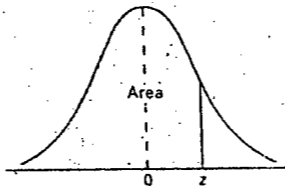


TABLE A.3 Areas Under the Normal Curve

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	0.0017	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	0.0352	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	0.0722	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

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	0.9278	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	0.9798	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

Chart 2 for Q no 8(c)
Md. danyal

SECTION – A

There are **FOUR** questions in this Section. Answer Q. No. 1 and any **TWO** from the rest.

1. (a) Explain with reference to the context any one of the following: (8)
- (i) “The state is not God. It has not the right to take away what it cannot restore when it wants to”.
- (ii) “I am sure you are Odysseus, the man whom nothing defeats”.
- (b) Answer any one of the following questions: (10)
- (i) Which aspect of the story “The Diamond Necklace” do you like most and why?
- (ii) What message do you get from the story ‘The Bet’?
- (c) Answer any three of the following: (12)
- (i) How does ‘The good’ win over ‘The evil’ in “Circe’s Garden”?
- (ii) Why does the lawyer denounce all material pursuits at the end of the story ‘The Bet’?
- (iii) Do you agree that Mrs. Matilda Loisel is the representative of every common lady in the society?
- (iv) Who is Eurylochus? What is his role in ‘Circe’s Garden’?
- (v) What is the tragic flaw of the character Mrs. Matilda Loisel?
2. (a) Recast and correct any ten of the following sentences: (20)
- (i) The end result was that we had no room.
- (ii) Adib is as reliable and in some ways more reliable than Rafid.
- (iii) My bicycle worths Tk. 10,000.
- (iv) We spoke with Dr. Joinal Abedin, M. D.
- (v) It is always enjoyable for a person to relax on a warm day.
- (vi) We are planning to finalize the agreement tomorrow.
- (vii) The farmer nearly lost one hundred cattle in the fire.
- (viii) It was her who first saw the intruder.
- (ix) Any ways you look at the question, Hasan is wrong.
- (x) As the days wore on, he became tired, bored and exhausted.
- (xi) The topics of my presentation is “Artificial Intelligence”.
- (xii) The month proceeding June was, of course, May.

HUM 185

3. (a) Give the meanings of any ten of the following words:

Aggravate, autonomous, bully, captive, equivocal, henceforth, induce, jeopardy, obsolete, prelude, random, reproach.

(10)

- (b) Make sentences with any ten of the following words:

Arduous, congenial, disseminate, expound, identical, hilarious, prolific, rancor, sue, call on, brush up on, keep up.

(10)

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

An intellectual is one who is an enlightened person. He has to give light to others who are in need of it. In every society we find intellectuals such as philosophers, scientists, scholars, writers and critics; and they, as enlightened men, have a great responsibility towards society. In a society all cannot be intellectuals. If a time comes when all are intellectuals, it would be a blessed time indeed. But at present, at any rate, all are not intellectuals and those who are intellectuals have the great responsibility of guiding others on to the right path. If today we have our civilization and culture, if we have order and security in life and if our life is better than that of our primitive ancestors it is because the intellectuals, from time to time have been guiding humanity on the path of felicity and amity. An intellectual should come out of his ivory tower and try to elevate others to his level. This is the theme of Jennyson's famous poem "The place of Art". An intellectual has the duty of seeing the truth and teaching it to others. An intellectual contemplates on the eternal laws of the universe to explore the truth. The perception of the truth is almost the same as the perception of beauty and the duty of an intellectual is the see this truth on beauty, and to reveal it to others.

(20)

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE** including Q. No. 5 as compulsory.

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

(30)

Primitive man found out by trial and error how to carry out a certain number of simple chemical changes, but under the ancient Egyptian civilization men learned how to work copper, tin, iron and precious metals; knew how to make pottery, glass, soap and colouring agents, and how to bleach and dye textile fabrics. These arts were the beginnings of the chemical industries of today.

The early scientific study of chemistry, known as alchemy, grew up in the first few centuries A. D. at Alexandria in Egypt. There two important things came together: one was the practical knowledge of the Egyptian workers in metals, pottery and dyes; another

Contd P/3

HUM 185

Contd ... Q. No. 5

was the learning of the earlier Greek philosophers, such as Hippocrates and Aristotle. At the same time alchemy was much influenced by ideas from the East about magic and astrology-foretelling the future from the stars.

Greek philosophers regarded debate about the nature of matter as superior to experiment, and some held that all matter was made up of the same four elements' – earth, fire, air and water. Many people therefore thought that if these elements could be rearranged, one substance could be changed into another. For instance, a base metal could perhaps be turned into gold. The chief aim of the alchemists was to find a way of doing this.

Alchemy came under Arab influence when the armies of Islam conquered Egypt during the 7th century. The Arabs carried its study into Western Europe when they advanced into Spain. Many Arabic words are still used in chemistry- 'alkali', 'alcohol' and even 'alchemy' itself, which means 'the art of Egypt'. The greatest Arab alchemist was Jabir Ibn Hayyan, possibly the same person as Geber, author of two important books on alchemy known from the Latin translations of the 13th century. Jabir claimed that mercury and sulphur were 'elements' like four Greek ones. He said that all metals were composed of mercury and sulphur in different proportions. To change a base metal into gold required the proportions to be changed by the action of a mysterious substance that came to be called 'the philosopher's stone'.

Alchemy was studied widely in Europe during the 12th and following centuries, and attracted the attention of many learned men. Though they were doomed to fail in their attempts to make gold their work led to the growth of a great deal of new chemical knowledge and of methods of making experiments. Many of the later European alchemists, however, were complete frauds who preyed upon trusting people by all sorts of tricks, and the subject fell into disrepute. By the first half of the 16th century, the aim of the alchemists had changed from the making of gold to the making of medicines. In particular they sought a fanciful substance called 'the elixir of life'; a powerful medicine which was to cure all ills. This phase of chemistry lasted till about 1700.

Questions:

- (i) What is alchemy?
 - (ii) When did alchemy come under Arab influence?
 - (iii) What did Greek philosophers regard about this?
 - (iv) What did Jabir say about metals?
 - (v) When was alchemy studied in Europe?
6. (a) Write a complaint letter to the General Manager of BTTB drawing his attention to the fact that you did not get telephone connection in due time despite completing necessary formalities.

(10)

Contd P/4

HUM 185

Contd ... Q. No. 6

- (b) Write phonetic transcription of the following words (any five) **(10)**
Charm, germinate, adroit, humanity, judge, local.
7. (a) Write a dialogue between two persons about the prospects of your discipline in professional arena in our country. **(10)**
- (b) Write a short composition on any one of the following: **(10)**
- (i) Technology in Next Thirty years,
 - (ii) Challenges of Urbanization,
 - (iii) Women and nation building.
8. (a) Transform the following sentences as directed: (any five) **(10)**
- (i) Success or failure depends largely on your own efforts. (Complex)
 - (ii) Taifa is too busy to come here. (Compound)
 - (iii) What he has said is true. (Simple)
 - (iv) The evil that men do live after them. (Compound)
 - (v) This must not occur again, or you will be dismissed. (Simple)
 - (vi)) A peculiar shiver ran down my spine. (Complex)
- (b) Write short notes on any two of the following: **(10)**
- (i) Diphthongs,
 - (ii) Quotaion letter
 - (iii) Back matter of a report.
-

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2014-2015

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

Full Marks : 210

Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – AThere are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Determine the node voltages v_1 , v_2 and v_3 using nodal analysis for the circuit in Fig. 1(a). Also determine power consumed/delivered by different circuit elements. (15)
(b) For the circuit shown in Fig. 1(b), find the current passing through the $1\text{ k}\Omega$ resistor. The current direction is shown in the figure. (20)
2. (a) For the circuit shown in Fig. 2(a), determine the voltage, v_0 using superposition theorem. (18)
(b) For the circuit shown in Fig. 2(b), find the current i_0 , passing through the $10\ \Omega$ resistor. (17)
3. (a) For the circuit shown in Fig. 3(a), using maximum power transfer theorem, determine the value of load resistor, R_L that would absorb maximum power. Also, determine the maximum power absorbed and efficiency of the circuit at maximum power condition. (20)
(b) Find the Norton equivalent circuit at terminals a-b for the circuit in Fig. 3(b) (15)
4. (a) For the circuit shown in Fig. 4(a) find out Z_T and V_{ab} (15)
(b) For the circuit shown in Fig. 4(b), find out voltage $v_0(t)$ using the superposition principle. (20)

SECTION – BThere are **FOUR** questions in this Section. Answer any **THREE**.

All the symbols used in this section have their usual meaning.

5. (a) For the periodic signal shown in Fig. 5(a) determine- (25)
(i) Effective value.
(ii) Form factor.
(iii) Crest factor.
(b) Show that for an identical power transmission, a three phase system requires less amount of copper than a single phase system. (10)
6. (a) In the circuit of Fig. 6(a), if $v_{ab} = 440 \angle 10^\circ\text{ V}$, $v_{bc} = 440 \angle 250^\circ\text{ V}$, $v_{ca} = 440 \angle 130^\circ\text{ V}$, then determine- (18)
(i) Line currents.
(ii) Transmission line losses.
(iii) Power delivered to the load.

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Contd ... Q. No. 6

(b) The two balanced load in Fig. 6(b) are supplied by an 840 v rms 60-Hz line. Load 1 is Y-connected with $30 + j 40 \Omega$ per phase, while load 2 is a balanced three phase induction motor drawing 48 kW at a power factor of 0.8 lagging. Assuming abc sequence, Calculate: (i) the complex power absorbed by the combined load.

(17)

(ii) the kVAR rating of each of the three Δ -connected capacitors connected in parallel to raise the power factor to unity.

(iii) the current drawn from the supply at unity power factor condition.

7. (a) A 440-v, 50-Hz, two pole, y-connected induction motor is rated at 75 kW. The equivalent circuit parameters are –

(20)

$R_1 = 0.075 \Omega$	$R_2 = 0.065 \Omega$	$X_M = 7.2 \Omega$
$X_1 = 0.17 \Omega$	$X_2 = 0.17 \Omega$	$P_{core} = 1.1 \text{ kW}$
$P_{F\&W} = 1 \text{ kW}$	$P_{misc} = 150 \text{ W}$	

For a slip of 0.04, find-

- (i) The line current I_L .
- (ii) The stator power factor
- (iii) Stator and rotor Copper loss.
- (iv) Power converted from electrical to mechanical form, P_{conv} .
- (v) Induced and load torque.
- (vi) Overall efficiency η .
- (vii) Motor speed in rpm.

(b) Derive the equation of the rotor induced torque in a three phase induction motor and show that the pull out torque is independent of rotor resistance.

(15)

8. (a) A 1 kVA, 230/115-v transformer has been tested to determine its equivalent circuit.

The results of the test are shown below-

(15)

$V_{OC} = 230 \text{ V}$	$V_{SC} = 19.1 \text{ V}$
$I_{OC} = 0.45 \text{ A}$	$I_{SC} = 8.7 \text{ A}$
$P_{OC} = 30 \text{ W}$	$V_{SC} = 42.3 \text{ W}$

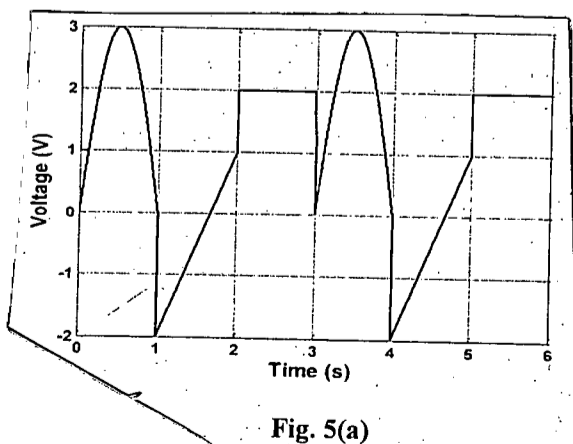
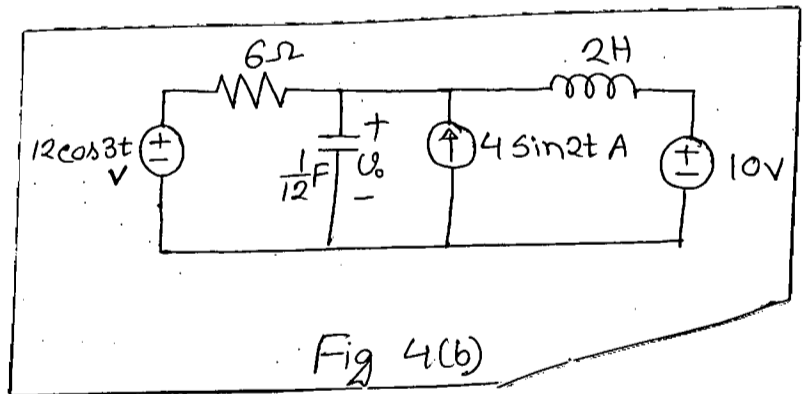
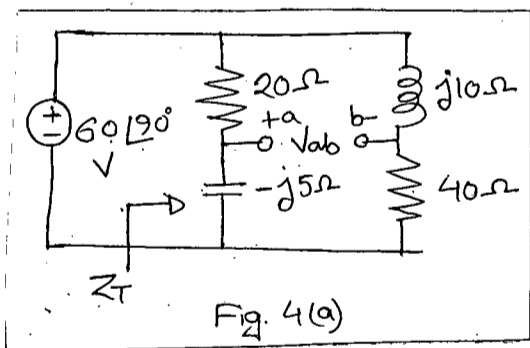
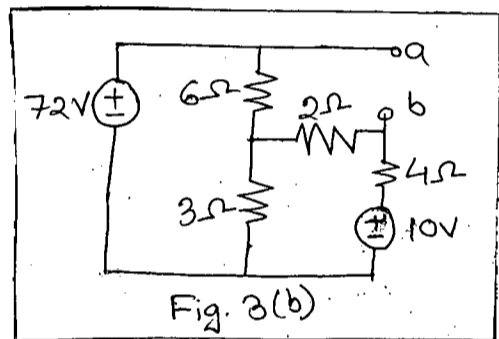
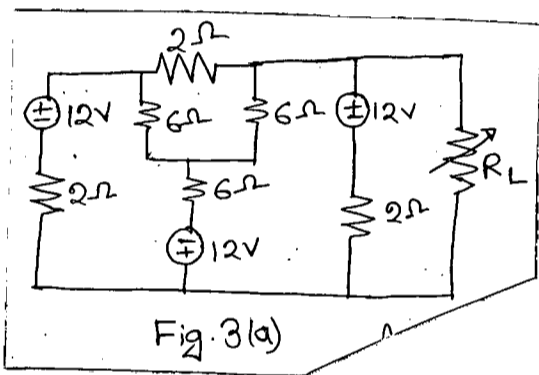
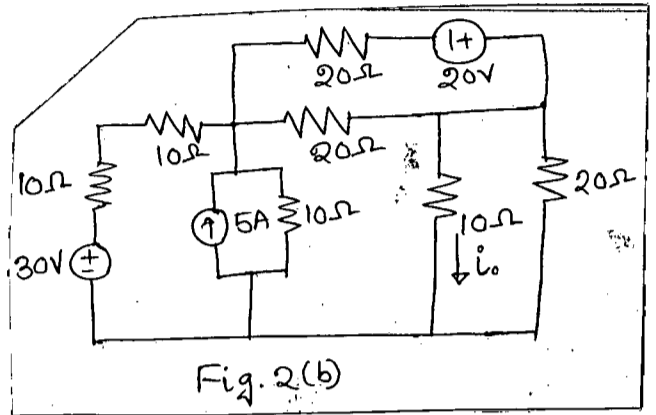
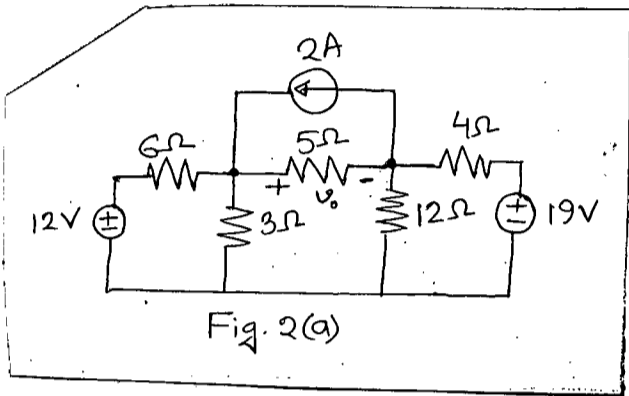
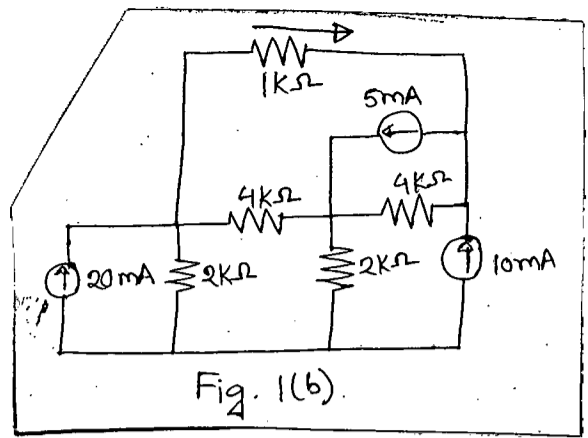
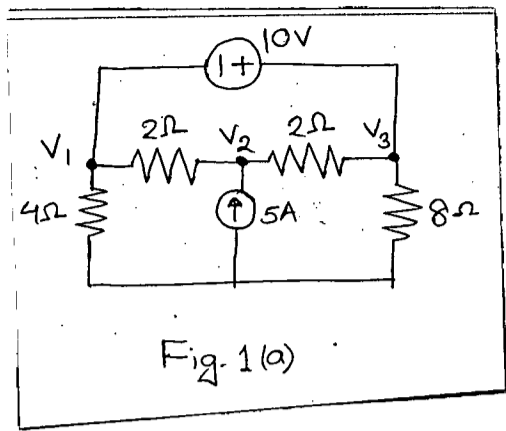
Find the equivalent circuit of this transformer referred to the low voltage side of the transformer.

(b) What are the components of excitation current of a transformer? How are they modeled in the transformer's equivalent circuit?

(10)

(c) Why does the short circuit test show only I^2R losses and open circuit test show only excitation losses?

(10)



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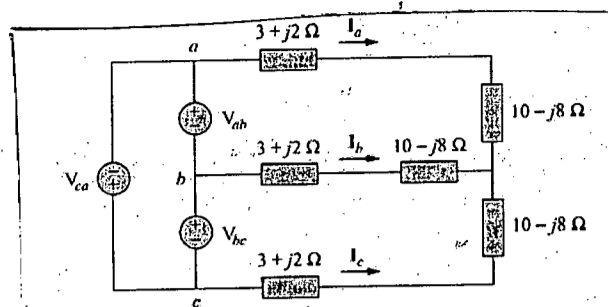


Fig. 6(a).

$3 + j2 \Omega$ and $10 - j8 \Omega$ represent transmission line and balanced load respectively

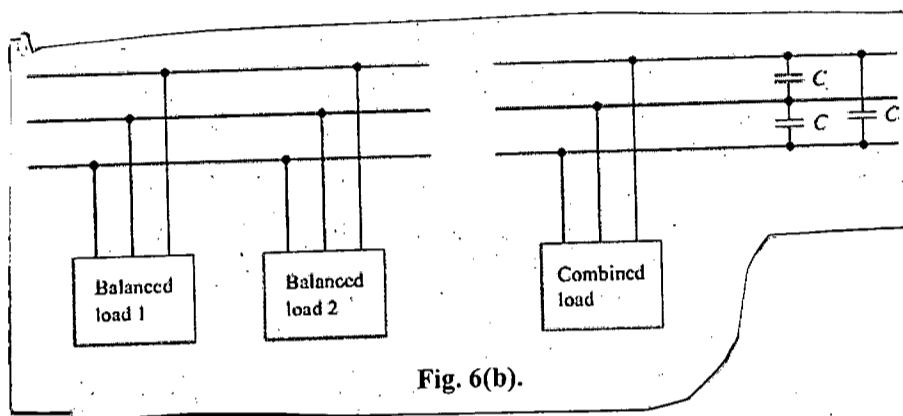


Fig. 6(b).