L-1/T-2/CE **Date : 12/03/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2016-2017

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

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

The 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) Calculate the power delivered or absorbed by the two dependent sources of the circuit shown in Fig. for Q. No. 1(a) using nodal analysis. **(20)**

   (b) For the circuit shown in Fig. for Q. No. 1(b), determine the value of V_s if current through the 6 Ω resistor is 1 A. **(15)**

2. (a) Calculate the value of V_s that is required to deliver 3.50 watts power to the 70 Ω resistor of the circuit shown in Fig. for Q. 2(a) using successive source transformation. **(20)**

   (b) For the circuit shown in Fig. for 2(b), use Norton's theorem to find the value of R_x which will result in $i_x = 10$ mA. **(15)**

3. (a) Using the principle of Superposition, determine i(t) of the circuit shown in Fig. for Q. 3(a). **(15)**

   (b) For the graph shown in Fig for Q. 3(b), calculate the average and effective value of the current waveform. Also, find the form factor and peak factor of this waveform. **(20)**

4. (a) Using mesh analysis, calculate the currents I_x and I_y of the circuit shown in the Fig. for Q. No. 4(a). (20)

   (b) For the circuit shown in Fig. for Q. 4(b), calculate the value of the capacitor that is required for making the current i(t) in phase with the sinusoidal voltage source. (15)

Contd P/2

EEE 165/CE

SECTION – B

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

5. (a) Why are three phase transmission systems preferred over single phase transmission systems? **(8)**

(b) Derive the relationship between phase voltage and line voltage of a Wye-connected (Y) balanced load for 'acb' sequence. Draw the corresponding phasor diagram showing all line and phase voltages. **(12)**

(c) For the Y-Δ system shown in Fig. for Q. No. 5(c), determine the following assuming abc phase sequence and $V_{AN} = 230\angle 0°$. **(15)**

(i) Line current and Phase current phasors as marked in the figure

(ii) Sending end line voltage

(iii) Receiving end line voltage

6. (a) A three-phase motor takes 10 kVA at 0.6 power factor lagging from a source of 220 V(rms). It is in parallel with a balanced delta load having 16-j12 Ω impedance in each phase. Find the power factor of the combined load and the line current. Determine the value of reactive components required to improve the overall power factor to 0.99 (lagging). What will be the line current at improved power factor condition? **(20)**

(b) What is the purpose of using transformers in electrical transmission and distribution network? **(5)**

(c) What are the differences between an ideal transformer and real transformer? **(5)**

(d) Briefly explain how eddy current loss and hysteresis loss are generated in a ferromagnetic core. **(5)**

7. (a) A 100 kVA, 60 Hz, 7200-480V, single phase transformer has the following parameters in ohms: **(20)**

$R_{HS} = 3.06$	$R_{LS} = 0.014$	$R_{C,HS} = 71400$
$X_{HS} = 6.05$	$X_{LS} = 0.027$	$R_{M,HS} = 17800$

Contd P/3

Contd ... Q. No. 7(a)

The transformer is supplying a load that draws rated current at 480 V and 75 percent lagging power factor.

Determine:

(i) Equivalent resistance and equivalent reactance refereed to the secondary side

(ii) Rated current of the primary and secondary side

(iii) Input voltage at the primary side

(iv) Voltage Regulation

(v) Exciting current of the transformer referred to primary side and no-load power factor

(b) What is the purpose of performing tests on a transformer? Discuss the differences in testing procedure for an open circuit test and a short-circuit test and their underlying assumptions. Draw the connection diagram and develop the equivalent circuit(s) for both tests. **(10)**

(c) The following test data are obtained from short-circuit and open-circuit tests of a 50 kVA, 2400-600 V, 60 Hz transformer: **(5)**

V_{oc} = 600 V	V_{sc} = 76.4 V
I_{oc} = 3.34 A	I_{sc} = 20.8 A
P_{oc}= 484 W	P_{sc} = 756 W

Determine the efficiency of the transformer when it operates at rated load and 0.8 power factor leading.

8. (a) Show that, a balanced three-phase set of currents flowing through three coils each 120° apart in space produces a rotating magnetic field. **(12)**

(b) Briefly explain the principle of operation of a three-phase induction motor. Why cannot an induction motor operate at synchronous speed? **(8)**

(c) A 30 hp, three-phase, 12 pole, 460 V, 60 Hz induction motor operating at off-rated load draws a line current of 35 A and has 90% efficiency and 80% power factor. Stator conductor loss, rotor conductor loss, and core loss are 850W, 485W and 415W, respectively. Determine **(15)**

(i) Input power, (ii) Shaft horsepower , (iii) Shaft speed , (iv) Shaft torque and

(v) Combined friction, windage and stray loss

Sketch a power flow diagram of this machine and mark the amount of power available at different points.

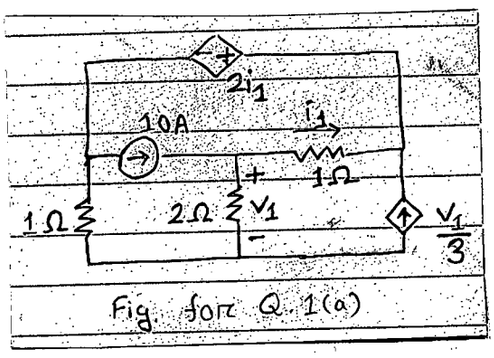


Fig. for Q. 1(a)

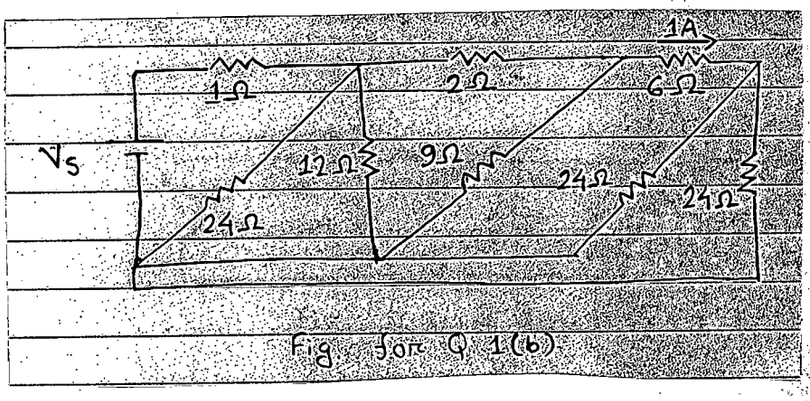


Fig. for Q. 1(b)

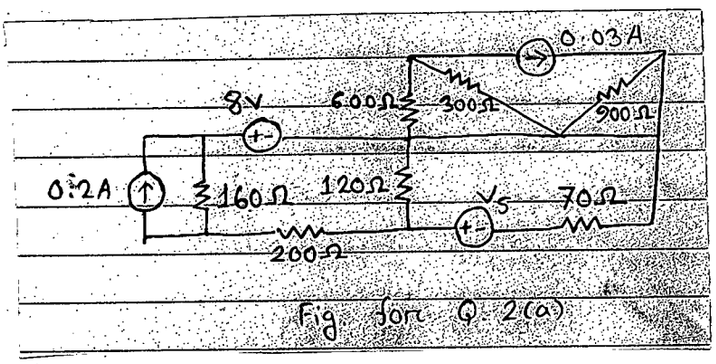


Fig. for Q. 2(a)

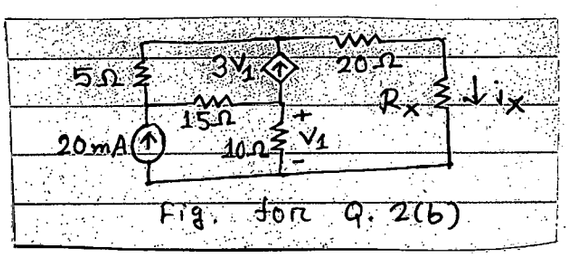


Fig. for Q. 2(b)

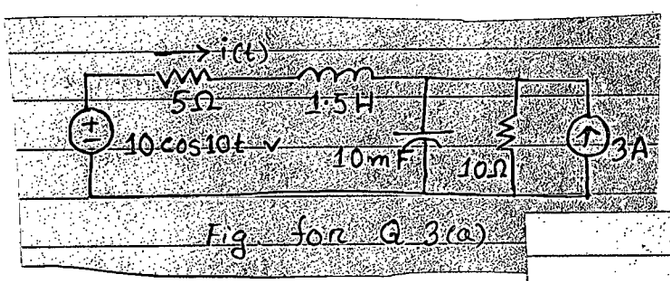


Fig. for Q. 3(a)

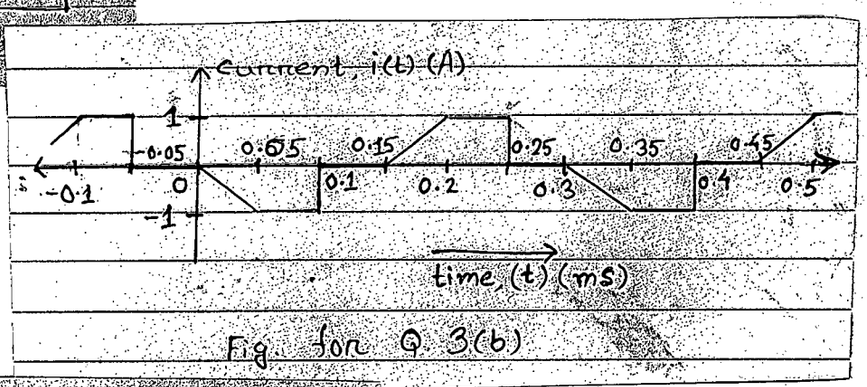


Fig. for Q. 3(b)

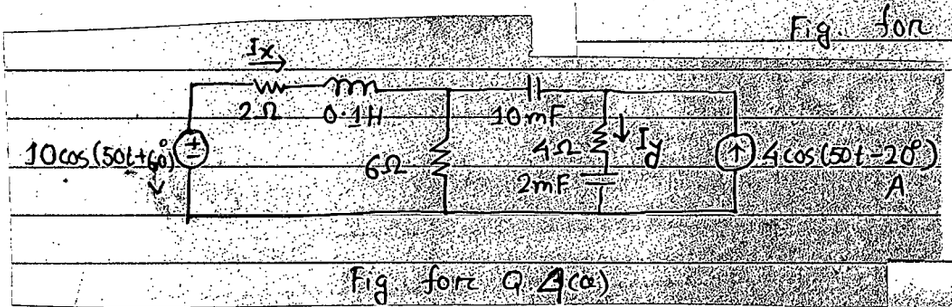


Fig. for Q. 4(a)

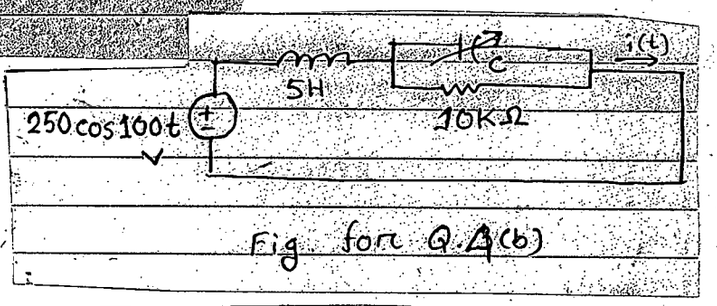


Fig. for Q. 4(b)

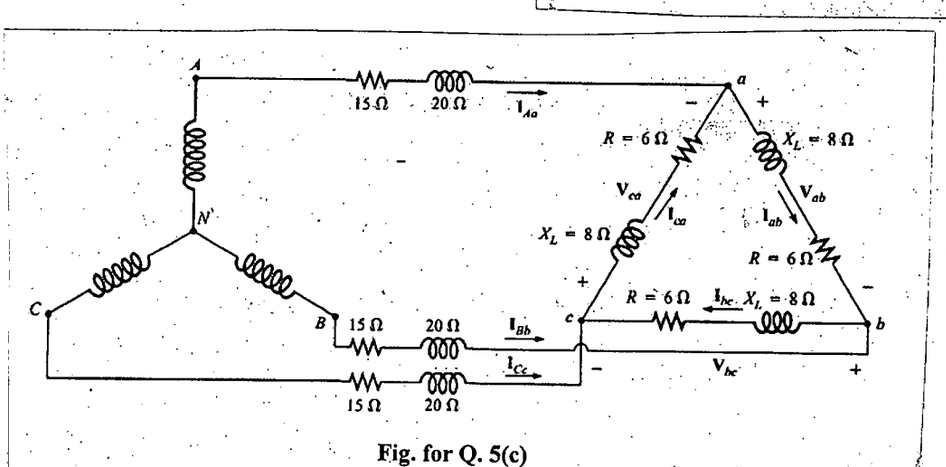


Fig. for Q. 5(c)

L-1/T-2/CE **Date : 18/02/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2016-2017

Sub : **CE 103** (Surveying)

Full Marks : 280 Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

Assume reasonable values for missing data, if any.

SECTION – A

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

1. (a) What are the functions of a transition curve? Use neat sketch where necessary. **(10)**

(b) Prove that shift, $S = L^2/24R$ where, L = length of transition curve and R = radius of curvature of circular curve. **(10)**

(c) What do you understand by the term 'degree of curvature'? Considering side friction (f), establish a relationship among design speed (v), radius of curvature (R) and rate of supper-elevation (e). **(10)**

(d) A parabolic vertical curve is to be set out connecting two uniform grades of +1.5% and –2.5%. The chainage and reduced level of point of vertical curve (PVC) are 1550 m and 30 m, respectively. The rate of vertical curvature, k is 35. Calculate the chainage and reduced levels of point of vertical intersection (PVI), point of vertical tangency (PVT) and midpoint of the curve. Here, k is the length of curve per percent algebraic difference in intersecting grades. **(16⅔)**

2. (a) What do you understand by 'DGPS'? Briefly explain how GPS technology can be used in a road construction project. **(10)**

(b) Briefly state some applications of 'GIS' and 'remote sensing' in civil engineering. **(10)**

(c) List the main features of a tacheometer. Briefly describe a method to obtain the constants of tacheometer in the field. **(10)**

(d) The elevation of a point P is to be determined by observations from two adjacent stations of a tacheometric survey. The staff was held vertically upon the point, and the instrument was fitted within an anallactic lens. The constants of the instrument are 100 and 0. Compute the elevation of the point P from the following data. Also calculate the distance of A and B from P. **(16⅔)**

Station	Height of axis (m)	Staff point	Vertical angle	Staff reading (m)			Elevation (m)
A	1.42	P	+5°30′	1.230	2.055	2.880	77.75
B	1.40	P	–3°30′	0.785	1.800	2.815	97.14

Contd P/2

CE 103

3. (a) What is local attraction? What are the causes of local attraction? How can you detect local attraction? **(10)**

(b) What is true bearing? The magnetic bearing of a line AB was N28°30′E in the year 1910. The declination at the time in the place was 7°15′ East. In the year 2010 the declination at the place was 3°30′ East. Determine the true bearing in 2010. **(10)**

(c) Compare between: (i) chain surveying and traverse surveying and (ii) automatic level and precise level for leveling. **(10)**

(d) A closed traverse was conducted round an obstacle and the following measurements were made. Find out the missing lengths ST and TP. Draw the traverse. **(16⅔)**

Side	Length of Side (m)	Bearing
PQ	500	98°30′
QR	620	N30°20′E
RS	468	N61°30′W
ST	?	S50°0′W
TP	?	N59°50′E

4. (a) Compare between: **(10)**

(i) Height of instrument method of leveling; rise and fall method of leveling

(ii) Square method of contouring and tacheometric method of contouring

(b) List the natural errors in leveling. How can you conduct leveling for a pond or lake which is too wide to be sighted across? **(10)**

(c) List five important characteristics of contour. Draw typical contour of 'steep slope' and 'river'. **(10)**

(d) The following data are taken from a level book in which some of the readings were found to be missing. Calculate the missing data (indicated by "?") and reduced level (R.L.) of all stations. Apply usual checks and draw necessary diagrams. **(16⅔)**

Station	Staff reading (m)			Rise (m)	Fall (m)	R.L. (m)	Remarks
	Back	Inter	Fore				
A	1.5						
B		2.1					
C	3.3		1.3				T.P.
D		?				11.5	B.M.
E	4.4		5.9	0.4			T.P.
F	?		3.3				T.P.
G			3.3	0.2			

Note: R.L. = Reduced level, T.P. = Turing Point, B.M. = Bench Mark.

Contd P/3

CE 103

SECTION – B

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

5. (a) From a location on earth the altitude a star above horizon is 71°20′. The position of the star is along the prime vertical circle during the time of observation. If Celestial North Pole is 38°30′ above horizon, determine-(i) azimuth of the star during time of observation, (ii) declination of the star and (iii) comment if the star is circumpolar or not. **(15⅔)**

[hint: for calculation your may use the cosine formula for spherical trigonometry.]

$$\cos A = \frac{\cos a - \cos b.\cos c}{\sin b.\sin c}$$

[Notations have their usual meaning]

(b) With the help of required illustrations, describe the chaining procedure for the following cases: **(15)**

(i) A survey line crosses the river obliquely

(ii) Chaining round the obstacle is possible by means of measuring angles.

(iii) Foot of the perpendicular of an object on chain line by swing method.

(c) Differentiate between plane surveying and geodetic surveying. Briefly discuss classification of surveying based upon the object of survey. **(4+6)**

(d) Discuss briefly graphical methods of determining area in surveying. **(6)**

6. (a) An engineer's chain is used for surveying an area. The air temperature in the field was 98.6°F. The chain was pulled with a constant force of 20 lb during measurement. The weight of the chain was found to be 4.5 lbs. **(16⅔)**

(i) Calculate the corrected chain length after applying necessary corrections,

(ii) Obtained data was used to draw a survey map to a scale of 1 inch = 25 feet. If the length of the baseline on the plan is 11.4 inch, find true length of the baseline.

(b) Prove that to be a circumpolar star, the polar distance for a celestial body should be equal or less than the latitude of that place. Draw neat sketch to support your explanation. **(8)**

(c) Write down some merits and demerits of the following methods of volume calculation (i) volume calculation using contour lines and (ii) volume calculation by spot height method. **(10)**

(d) Write short notes on: **(12)**

(i) Exposure Station (ii) Relief Displacement (iii) EDM

Contd P/4

CE 103

7. (a) Photographs of a certain area were taken from A and B, two camera stations, 10 m apart (see figures). The axis of the camera makes an angle of 50°and 46° with the base line at stations A and B respectively. The image of a point D appears 12 mm to the left and 6 mm above the hair lines on the photographs taken at A and 15 mm to the left on the photograph taken at B as shown in Figure 7. RLs of the camera axis at station A and B are 3.5 m and 3.6 m respectively. Calculate the distances of point D from both of the stations and the distance Yp in the photograph taken from Station B. Assume focal length of the camera as 200 mm. **(20⅔)**

(b) Classify Photogrammetry and briefly describe two types of photogrammetry. What are the requirements of an aerial camera? **(8+5)**

(c) What is project surveying? Write down the sequences, operations and considerations of Dhaka Elevated Expressway Project Survey. **(8)**

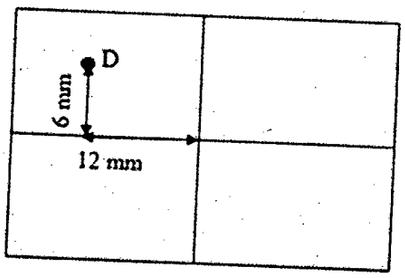
(d) Write short notes on Crab and Drift with proper illustrations. **(5)**

8. (a) A borrow pit is excavated on a ground surface. Dimension of the excavation is shown in figure (8a). Assume ground slope = 1:10 and side slope of the pit 1: 2. Calculate the volume of excavation. **(20⅔)**

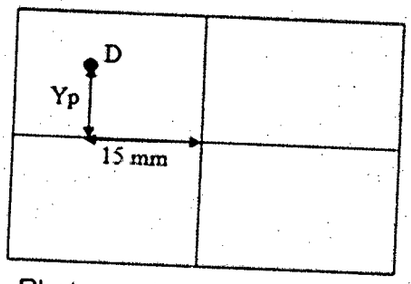
(b) Derive the equation to compute length of line between two points of different elevations from measurements on a vertical photograph. **(8)**

(c) Diagrammatically show the following positions on a celestial sphere – (i) right ascension, (ii) hour angle, (iii) 1st point of aris, (iv) declination of a star (v) altitude of star and (vi) azimuth of a star. **(6)**

(d) Discuss briefly different co-ordinate systems used in field astronomy. **(12)**



Photograph from Station A



Photograph from Station B

Figure for Question No.-7(a)

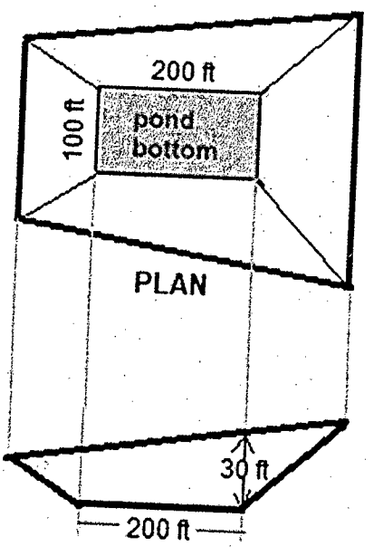


Figure for Question No.-8(a)

L-1/T-2/CE **Date : 24/02/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2016-2017

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

Full Marks : 210 Time : 3 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) Find the differential equation corresponding to the family of curves $y=c(x-c)^2$, where c is an arbitrary constant. **(10)**

   (b) Solve the following differential equations:

   (i) $(4x-y+7)dx-(2x+y-1)dy=0$ **(15)**

   (ii) $\frac{dy}{dx}=\frac{y}{x}\left(log\frac{y}{x}+1\right)$ **(10)**

2. (a) Solve: $x(1-x^2)\frac{dy}{dx}+y(2x^2-1)=ax^3$ **(12)**

   (b) Test whether the following differential equation is exact or not and then solve

   $$(y^4+2y)dx+(xy^3+2y^4-4x)dy=0$$ **(12)**

   (c) The number of bacteria in a yeast culture grows at a rate which is proportional to the number present. If the population of a colony of yeast bacteria triples in 1 hour, find the number of bacteria which will be present at the end of 6 hours. **(11)**

3. Solve the following higher order differential equations:

   (a) $\frac{d^2y}{dx^2}+4y=x\sin x$ **(12)**

   (b) $\frac{d^3y}{dx^3}-3\frac{d^2y}{dx^2}+4\frac{dy}{dx}-2y=e^x+\cos x$ **(11)**

   (c) $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+4y=x^2\sin(\log x)$ **(12)**

Contd P/2

MATH 139/CE

4. (a) Form a partial differential equation by climinating the arbitray function ϕ from $\phi\left(\tan x+\sin^{-1} y-\log z,\ e^{x}-\sec y+z^{3}\right)=0.$ **(10)**

   (b) Apply Lagrange method to solve $(x+2z)p+(4zx-y)q=2x^{2}+y.$ **(12)**

   (c) Find the complete integral of $pxy+pq++qy=yz.$ **(13)**

SECTION – B

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

5. Solve the following:

   (a) $\left(D_x^2-2D_xD_y-3D_y^2\right)z=\cos(2x+y)$ **(11)**

   (b) $\left(3D_x^2-2D_y^2+D_x-1\right)z=e^{(x+y)}\cos(x+y)$ **(12)**

   (c) $\left(x^2D_x^2-y^2D_y^2\right)z=x^3y$ **(12)**

6. (a) Calculate the two regression equations and the coefficients of correlation from the data given bellow: **(20)**

Age of husband	22	25	28	31	35	32	37	39	41	45
Age of wife	19	18	22	29	31	23	30	33	37	39

   Also estimate the most likely age of wife when husband's age is 36 and the age of husband when wife's age is 32.

   (b) Define Degrees of Freedom and Type Two error. The average score of a sixth-grander in a certain school district on a math aptitude exam is 89 with a standard deviation of 6.4. A random sample of 28 students in one school was taken. The mean score of these students was 84. Does this indicate that the students of this school are significantly slower in their mathematical ability? Use 5% Level of significance. (Necessary chart 1 is attached). **(15)**

7. (a) For the following incomplete frequency distribution, it is known that total frequency is 1000 and the median is 421. Estimate the missing frequencies and hence find the modal value of the completed table. **(20)**

Contd P/3

MATH 139/CE

Contd ... Q. No. 7(a)

Variable	Frequency
300-325	5
325-350	17
350-375	80
375-400	?
400-425	326
425-450	?
450-475	88
475-500	9

Compute: (i) Pearson's coefficient of skewness, (ii) β_1 and β_2. Hence comment on the shape of the distribution.

(b) One prominent physician claims that 20% of those with lung cancer are chain smokers. If his assertion is correct, find the probability that of (i) 12 and (ii) 18 such patients recently admitted to a hospital, fewer than half are chain smokers, using binomial distribution and Poisson approximation to the binomial distribution. **(15)**

8. (a) A fair coin is tossed until a head appears or it has been tossed three times. Given that the head does not appear on the first toss, what is the probability that the coin is tossed three times? **(10)**

(b) Heights of BUET students are assumed to be normal random variable. It is known that 20% of the students have heights under 66 inches and 10% exceed 72 inches. What percentage of students has heights between 60 and 74 inches? (Necessary chart 2 is attached). **(10)**

(c) An electrical circuit system is given in Fig. 1. The reliability (Probability of working) of each component are also shown in Fig. 1. **(15)**

(i) What is the probability that the entire system works?

(ii) Given the system works, what is the probability that the component A is not working?

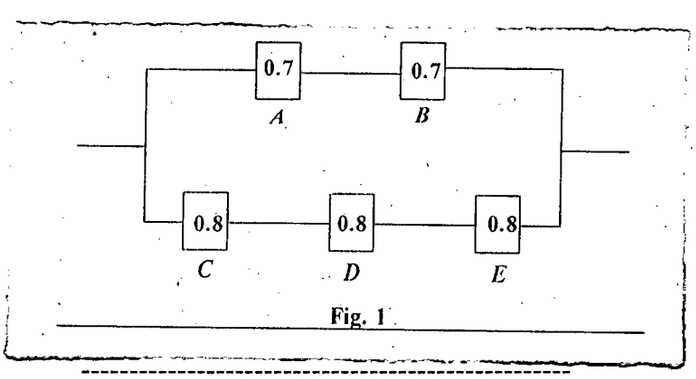


Fig. 1

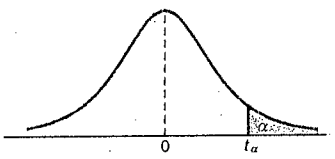


Table A.4 Critical Values of the t-Distribution

	α						
v	**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(b)

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

	α						
v	**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

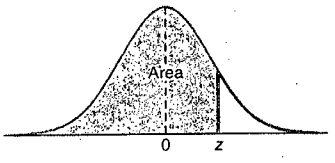


Table A.3 Areas under the Normal Curve

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(b)

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	0.9798	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

L-1/T-2/CE **Date : 28/02/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2016-2017

Sub : **HUM 185** (English)

Full Marks : 140 Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

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 Cod. It has not the right to take away what it cannot restore taken it wants to.

(ii) How singular is life and how full of change! How small a thing will ruin or save one!

(b) Answer any one of the followings: **(10)**

(i) How did Laura Sheridan's confrontation with the dead body of Mr. Scott initiate a transformation in his character? Explain.

(ii) In Chekhov's "The Bet", The Banker argued that capital punishment is more humane than life imprisonment. Do you agree with him? Why or why not?

(c) Answer any three of the following: **(12)**

(i) What does the hat symbolize in "The Garden Party"?

(ii) How did the lawyer's reading preferences change gradually in "The Bet"?

(iii) What were the terms and conditions of the Bet in Anton Chekov's "The Bet"?

(iv) Comment on the character of Matilda Loisel in "The Diamond Necklace".

(v) Why did the Sheridan's overlook their neighbour's death in "The Garden Party"?

2. Recast and correct any ten of the following sentences: **(20)**

(i) The cashier gave me two hundred and sixteen dollars sixty two cents.

(ii) It is probable that the prototype might be ready for testing towered the end of the next year.

Contd P/2

HUM 185/CE

Contd ... Q. No. 2

(iii) We regret informing you that your application has been denied.

(iv) The interview was broadcasted on BBC.

(v) She recommended me that I take a few days off from work.

(vi) Kevin stopped travelling because of his illness.

(vii) The four participants discussed it between themselves.

(viii) The government requires that these forms should be submitted before the end of the financial year.

(ix) Being abandoned by our friends is the cause of great sorrow for us.

(x) It ought to be she with whom you share your secrets, not me.

(xii) Let's discuss about this novel.

(xiii) The mole is a mammal regarded as pests by gardeners because of their burrowing activity spoiling lawns and gardens.

3. (a) Give the meanings of and make sentences with any ten of the following words: **(20)**

Emulate, Sporadic, Credulous, Arduous, Inquisitive, Oblivion, Cataclysm, Equivocal, Plea, Sagacity, Plausible, Unilateral.

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

With a little more deliberation in the choice of their pursuits, all men would perhaps become essentially students and observers, for certainly their nature and destiny are interesting to all alike. In accumulating property for ourselves or our posterity, in founding a family or a state, or acquiring fame even, we are mortal; but in dealing with truth we are immortal, and need fear no change nor accident. The oldest Egyptian or Hindoo philosopher raised a corner of the veil from the statue of the divinity; and still the trembling robe remains raised, and I gaze upon as fresh a glory as he did, since it was I in him that was then so bold, and it is he in me that now reviews the vision. No duct has settled on that robe; no time has elapsed since that divinity was revealed. That time which we really improve, or which is improvable is nerither past, present, nor future.

Contd P/3

HUM 185/CE

Contd ... Q. No. 4

To read well, that is, to read true books in a true spirit, is a noble exercise, and on that will take the reader more than any exercise which the customs of the day esteem. It requires a training such as the athletes underwent, the steady intention almost of the whole life to this object. Books must be read as deliberately and reservedly as they were written. It is not enough to be able to speak the language of that nation by which they are written, for there is a memorable interval between the spoken and the written language, the language heard and the language read. The one is commonly transitory, a sound, a tongue, a dialects merely, and we learn it unconsciously. The other is the maturity and experience of that; a reserved and select expression. A written world is the choicest of relics. It is something at once more intimate with us and more universal than any other work of art.

SECTION – B

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

Symbols have their usual meaning.

5. (a) It has been pointed out that learning mathematics and science is not so much learning facts as learning ways of thinking. It has also been emphasized that in order learn science, people often have to change the way they think in ordinary situations. For example, in order to understand even simple concepts such as heat and temperature, ways of thinking of temperature as a measure of heat must be abandoned and a distinction between 'temperature' and 'heat' must be learned. These changes in ways of thinking are often referred to as conceptual changes. But how do conceptual changes happen? How do young people change their ways of thinking as they develop and as they learn in school? Traditional instruction based on telling students how modern scientists think does not seem to be very successful. Students may learn the definitions, the formula, the terminology, and yet still maintain their previous conceptions. This difficulty has been illustrated many times, for example, when instructed students are interviewed about heat and temperature. It is often identified by teachers as a difficulty in applying concepts learned in the classroom; students may be able to repeat a formula but fail to use the concept represent by the formula when they explain observed events. The psychologist Piaget suggested an interesting hypothesis relating to the process of cognitive change in children. Cognitive change was expected to result from the pupils' own intellectual activity. When confronted with a result that challenges their thinking - that is, when faced with conflict - pupils realize that they need to think again about their own ways of solving problems, regardless of whether the problem is one in mathematics or in science. He hypothesized that conflict brings about disequilibrium, and then triggers equilibration processes that ultimately produce cognitive change.

Contd P/4

HUM 185/CE

Contd ... Q. No. 5(a)

For this reason, according to Piaget and his colleagues, in order for pupils to progress their thinking they need to be actively engaged in solving problems that will challenge their current mode of reasoning. However, Piaget also pointed out that young children do not always discard their ideas in the face of contradictory evidence. They may actually discard the evidence and keep their theory.

Piaget's hypothesis about how cognitive change occurs was later translated into an educational approach which is now termed 'discovery learning'. Discovery learning initially took what is now considered the 'lone learner' route. The role of the teacher was to select situations that challenged the pupils' reasoning; and the pupils' peers had no real role in this process. However, it was subsequently proposed that interpersonal conflict, especially with peers, might play an important role in promoting cognitive change. This hypothesis, originally advanced by Perret Clermont (1980) and Doise and Mugny (1984), has been investigated in many recent studies of science teaching and learning. Christine Howe and her colleagues, for example, have compared children's progress in understanding several types of science concepts when they are given the opportunity to observe relevant events. In one study, Howe compared the progress of 8 to 12-year-old children in understanding what influences motion down a slope. In order to ascertain the role of conflict in group work, they created two kinds of groups according to a pre-test: one in which the children had dissimilar views, and a second in which the children had similar views. They found support for the idea that children in the groups with dissimilar views progressed more after their training sessions than those who had been placed in groups with similar views. However, they found no evidence to support the idea that the children worked out their new conceptions during their group discussions, because progress was not actually observed in a post-test immediately after the sessions of group work, but rather in a second test given around four weeks after the group work.

Questions: **(30)**

(i) Give an appropriate title with justification.

(ii) Why is acquiring the principles of mathematics and science not so much learning facts as learning ways of thinking?

(iii) How do children learn according to Piaget?

(iv) What is discovery learning?

(v) Describe Howe's experiment with children.

(vi) Give the meanings of the following words:

Cognitive, disequilibrium, lone learner, interpersonal, ascertain

Contd P/5

HUM 185/CE

6. (a) You have bought a new mobile phone and found it not working. Write a letter of complaint to the dealer. **(10)**

   (b) Write phonetic transcriptions of any five of the following words: **(10)**

   cover, shame, pleasure, enrich, teach, angle.

7. (a) Write a dialogue between two students of your department about the prospects of Civil Engineering in Bangladesh. **(10)**

   (b) Write a short composition on one of the following topics: **(10)**

   (i) The Power of Positive Thinking (ii) The Rohingya: A People without Land and Citizenship (iii) Acquiring a New Skill

8. (a) Transform any five of the following sentences as directed. **(10)**

   (i) He succeeded unexpectedly. (Complex)

   (ii) It is difficult to explain, but it exists. (Simple)

   (iii) We are all born with a divine fire in us. (Complex)

   (iv) He will not go unless, he is compelled. (Simple)

   (v) Hearing the teacher's footsteps, the children kept silent. (Compound)

   (vi) This is a flower vase. (Complex)

   (b) Write short notes on any two of the following: **(10)**

   (i) Structure of a paragraph (ii) phonemes (iii) Annual Confidential Report.

L-1/T-2/CE **Date : 06/03/2018**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-1/T-2 B. Sc. Engineering Examinations 2016-2017

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 – A

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

1. (a) What is an electric dipole? Define electric dipole moment. Deduce an expression for the electric field, $\vec{E}$, for points on the axis of a circular ring of radius a having charge, q at a distance x from its centre. **(8+20)**

   (b) Calculate the intensity of electric field due to an electric dipole of dipole moment $p = 4.5 \times 10^{-10}$ Coul-m at a distance of 2 m on the perpendicular bisector of the axis from the centre of the dipole. **(7)**

2. (a) What are Kirchoff's rules for the distribution of currents in a network of conductors? Obtain the expressions for the growth and decay of charge when a capacitor is charged through a resistor for a constant emf and when discharging the capacitor through the resistor after shorting the circuit. **(8+20)**

   (b) A 2 μF capacitor is allowed to discharge through an unknown resistor. If the charge on the capacitor takes 69.30 seconds to drop to half of its original value. What is the value of the resistor? **(7)**

3. (a) State and explain laws of electromagnetic induction. Explain self-inductance and find its expression. Obtain an expression for self-inductance at centre of a Solenoid. (Imagine no medium insider the solenoid). **(6+6+16)**

   (b) A solenoid 500 cm long has 1000 turns. The magnetic induction near the centre of the solenoid is 0.16T. What is the current in the solenoid? **(7)**

4. (a) What do you mean by defects in crystals? Describe briefly various types of defects that exist in solids. **(10)**

   (b) Distinguish between lattice energy and cohesive energy of an ionic crystal? Show that for an ionic crystal the lattice energy is given by **(18)**

$$V = -\frac{\alpha e^2}{4\pi\varepsilon_0 r_0}\left(1-\frac{1}{n}\right),$$

   where the symbols have their usual meaning.

   (c) Write short notes on: (i) Valence band (ii) Conduction band, and (iii) Energy gap. **(7)**

Contd P/2

PHY 151/CE

SECTION – B

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

5. (a) Explain the terms space lattice and basis of a crystal. **(8)**

   (b) What are the lattice parameters of a unit cell? Write down the lattice parameters for orthorhombic and cubic crystal systems. Draw the unit cells for various space lattice in orthorhombic and cubic crystal systems. **(16)**

   (c) Draw a schematic diagram of a unit cell for the 3D hexagonal crystal system. Calculate c/a ratio for this crystal system. Provide some examples of hexagonal crystal system. **(11)**

6. (a) Derive the relationship between unit cell edge length and atomic radius for face-centered cubic and body-centered cubic crystals with a neat diagram. **(12)**

   (b) Show that the theoretical density of a cubic crystal is $\rho = \frac{1}{a^3}.n.\frac{M_A}{N_A}$ **(8)**

   where a is the lattice constant, n is the number of atoms per unit cell, M_A is the atomic weight of the material, and N_A is the Avogadro's number.

   (c) What is the crystal structure of platinum metal? Sketch (100) plane of platinum crystal in a typical unit cell. Atomic radius of platinum is 0.130 nm. (i) What is the area of this plane? (ii) Calculate the number of atoms/mm^2 in (100) plane of platinum crystal. (iii) Calculate density and packing factor for platinum crystal. **(15)**

7. (a) Why do you need transformation equations to explain an event in relativistic mechanics? Derive the Lorentz transformation equations and corresponding velocity transformation equations in relativistic mechanics. **(18)**

   (b) What modifications were done on the Michelson-Morley's interferometer to obtain the LIGO's interferometer? **(6)**

   (c) The relativistic equation for the kinetic energy of a body is $K = mc^2 - m_0c^2$, where the symbols have their usual meaning. Find the kinetic energy of the body when it is moving with a low speed compared to that of light. Also find the speed of an electron having kinetic energy of 0.100 MeV both according to classical and relativistic mechanics. **(11)**

8. (a) Find the expression for Compton shift explaining the Compton scattering process. Explain the relative probability of occurring photoelectric effect, Compton scattering and pair production with the incident photon energy. **(20)**

   (b) In spite of its negative charge why electron cannot stay inside a nucleus? **(5)**

   (c) How does a radioactive nucleus produce energy? If efficiency of a nuclear reactor to produce electric energy from thermal energy is 20%, calculate the electric energy produced from the fission of 2 gm of $_{92}U^{235}$ in kWh. Given that the energy released per fission is 200 MeV. **(10)**