L-2/T-2/NAME **Date : 16/07/2016**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

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

Sub : **NAME 217** (Theoretical Ship Design)

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) Explain the basic design, contract design and detailed design from view point of ship design process. **(15)**

   (b) Draw a design spiral in a ship design process. **(10)**

   (c) Classify the marine vehicles based on lifting (supporting) force. **(10)**

2. (a) Design light weight and dead weight. Make a list of items included in light weight and dead weight. **(10)**

   (b) A 1500 tonne dwt inland oil tanker is 65 m LBP, 10.8 m Bredth (moulded), 5.3 m Depth (moulded) and 3.9 m design draft (moulded. Her C_B is 0.75 and C_D (dead weight coefficient) is 0.80. A new similar design is being considered, but with a dwt of 1750 tonnes. Estimate the new principal dimensions, displacement, and light weight. **(15)**

   (c) Find the breadth and depth of a container hold in a container ship carrying "n" numbers of cells located transversely and "m" numbers of tiers in hold. **(10)**

3. (a) An inland container ship is 75 m LBP, 15.0 m Breadth (moulded) and 7.0 m Depth (moulded). She has a finished steel weight of 876 tonnes. A new ship has preliminary dimensions of 90 LBP, 18.0 m Breadth (moulded) and 8.5 m Depth (moulded). Estimate the steel weight for the new design after correcting for main dimensions only using method of differences. **(20)**

   (b) From view point of steel weight calculation of ship, explain block coefficient correction, scantling correction and deck sheer correction. **(15)**

4. (a) A basic general cargo ship is 134 m LBP, 18.12 m Breadth (moulded) with a final wood and outfit (W&O)weight of 700 tonnes. A new similar ship has an LPB of 138.5 m and a Breadth (moulded) of 18.70 m. Estimate the new W&O weight for new design using coefficient procedure and proportional procedure method. **(15)**

   (b) A box shaped barge of uniform construction is 32 m long and displaces 352 tonnes when empty is divided by transverse bulkheads into four equal compartments. Cargo is loaded in each compartment and level stowed as follows: **(20)**

   No. 1. Hold – 192 tonnes
   No. 2. Hold – 224 tonnes
   No. 3. Hold – 272 tonnes
   No. 4. Hold – 176 tonnes

   Find the maximum bending moment.

Contd P/2

NAME 217

SECTION – B

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

The symbols have their usual significance.

5. (a) Show that Capital Recovery (CR) factor can be expressed as **(15)**

$$C_R = \frac{i(1+i)^N}{(1+i)^N - 1}$$

(b) 11,000 ton payload cargo ship makes 10 round voyages per annum with 60% load factor. The voyage costs are $ 30,000 per trip, annual operating costs $ 290,000 and trip freight rate is $ 15 per ton after commission. The ship cost is $ 3000,000 and her expected life is 15 years, 8% discount rate, zero resale value and 50% tax rate. Calculate the net present value of cash flow using free depreciation method. **(20)**

6. (a) What are the criteria to be fulfilled for IMO standard of ship manoeuvrability? **(15)**

(b) Describe various tests for the measures of ship manoeuvrability. **(20)**

7. (a) Label the positions of the ship powers P_E, P_T, P_D, P_B, P_S and P_I by sketching the propeller shaft, from the propeller itself to the engine room. **(15)**

(b) A twin-screw passenger cargo ship is of 19470 tonnes displacement. She has the following particulars: **(20)**

Ship speed (kt)	15	16	17	18
P_{NE} (kw)	2990	3750	4620	5640
QPC	0.730	0.730	0.720	0.710

(i) Determine the service speed of the vessel if the brake power of each engine is limited to 4050 kw.

Assume weather and appendage allowances = + 30%

Assume propeller shaft efficiency = 97%

(ii) Estimate the A_C corresponding to the obtained speed.

8. (a) Draw a flow chart for the various components of ship power estimate and the stages in the powering process. **(15)**

(b) The full-scale ship is 140 m long and has speed 15 kn, the model 4.9 m. The resistance is measured to 19 N in the model basin. Following the ITTC' 57. What is the predicted full-scale resistance? **(20)**

The wetted surface of the full-scale ship is 3300 m^2. The density of sea water 1025 kg/m^3, that of fresh water 1000 kg/m^3, $\nu_m = 1.14 \times 10^{-6}$ m^2/s for fresh water, $\nu_s = 1.19 \times 10^{-6}$ m^2/s for sea water. Use a correction co-efficient of $C_A = 0.0004$.

L-2/T-2/NAME **Date : 20/07/2016**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

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

Sub : **HUM 211** (Sociology)

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 any **THREE**.

1. (a) Describe the insecurities, risks, and lifestyle changes that factory laborers faced during Industrial revolution. **(13 1/3)**

   (b) How did a simple religious belief 'protestant ethics' motivate capitalism in Europe? **(10)**

2. (a) Make a unified, coherent discussion in which you evaluate multiple perspectives on the impact of globalization on the world. State and develop your own perspective on the issue as well. **(13 1/3)**

   (b) Generalize the assumptions related to population given by Thomas Robert Malthus. **(10)**

3. (a) Organize sustainable ways to reduce environmental pollution. **(13 1/3)**

   (b) Elaborate the reasons and impacts of rural-urban migration in Bangladesh. **(10)**

4. Write short notes on any THREE of the following: **(23 1/3)**

   (a) Causes of rapid population growth rate in Bangladesh.

   (b) Calculation of crude birth rate.

   (c) Water pollution

   (d) New urban sociology

SECTION – B

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

5. (a) 'Sociological imagination is an unusual type of creative thinking for understanding social relationships' – Explain. **(10)**

   (b) Critically discuss functionalist theoretical perspective with examples. **(13 1/3)**

Contd P/2

HUM 211/NAME

6. (a) What do you understand by social norms? Explain different types of social norms and their practices. **(10)**

   (b) What is dominant ideology? How do ethnocentrism and dominant ideology influence the roles of culture of a society? **(13 ⅓)**

7. (a) What is social stratification? Explain the nature of caste system and class system of social stratification. **(10)**

   (b) What is social mobility? Discuss different types of social mobility with suitable examples. **(13 ⅓)**

8. Write short notes on any three of the following: **(23 ⅓)**

   (a) Marx's theory of class differences.
   (b) Anomie theory of deviance.
   (c) Types of crime.
   (d) Subculture and counter culture.

L-2/T-2/NAME Date : 26/07/2016

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

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

Sub : **NAME 223** (Marine Hydrodynamics)

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**.

Symbols have their usual meaning.

Reasonable value of any missing data can be assumed.

1. (a) What are the approaches for analyzing fluid motion? Explain those with suitable examples. **(10)**

   (b) Consider first the one-dimensional fluid flow and then derive the equation of continuity. **(10)**

   (c) Distinguish among streamline, streak line, path line. **(5)**

   (d) Describe some characteristics of streamline flow patterns. **(10)**

2. (a) Derive Euler's equation of motion for a non-viscous fluid. **(20)**

   (b) If consideration is restricted to the movement of fluid particle along its streamlines in steady flow, deduce Bernoulli's equation in the restricted form. **(15)**

3. (a) Explain graphically how a circle can be transformed into a straight line. **(15)**

   (b) Applying successive transformation, describe how a uniform flow can be transformed to a vertical wall and hence prove that the complete transformation function is $w = \sqrt{\left(z^2 + l^2\right)}$. **(20)**

4. (a) Apply Kelvin's circulation theorem to analyze flow around a hydrofoil. **(15)**

   (b) Derive the expression of lift coefficient for an infinite aerofoil and based on the curve of lift coefficient explain what you recommend for the design of rudder-steering system. **(20)**

Contd P/2

NAME 223

SECTION – B

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

Symbols have their usual meaning.

Reasonable value can be assumed for any missing data.

5. (a) What is the "boundary layer"? Give definition for, **(10)**

   (i) boundary layer thickness

   (ii) displacement thickness of the boundary layer.

   (b) Distinguish between laminar, transition and turbulent boundary layer. With figure demonstrate velocity distributions in flow past a flat plate having mentioned three boundary layers. How Reynold's number value can be used to define the different boundary layers? **(15)**

   (c) A flat plate is immersed, parallel to the direction of flow, in water flowing at 8 ft/sec. Estimate the length of the laminar section of the boundary layer for which $R_n = 5 \times 10^5$ and the boundary layer thickness at distance of 2 ft from the leading edge. **(10)**

   Given: $\nu = 1.06 \times 10^{-5}$ ft^2/sec.

6. (a) Define simple source. With figure demonstrate the flow pattern due to a source at point $P(x_1, y_1)$. Derive the expression for ϕ and ψ. **(15)**

   (b) Define irrotational vortex. Prove for irrotational vortex, **(20)**

   $v_\theta \cdot r$ = constant

7. (a) Define vortex pair. With figure demonstrate (i) unsteady pattern (ii) steady pattern of flow for a vortex pair. **(15)**

   (b) What is spiral vortex? With figure demonstrate the flow pattern due to spiral vortex. **(20)**

8. (a) Mention Blassius's theorem for determining the resultant force and moment exerted by a fluid in steady two-dimensional flow past a cylinder of any cross-sectional form. Hence prove the theorem. **(20)**

   (b) Following Blassius's theorem for a flow past a circular cylinder, with circulation show that the drag force is zero and the lift force is $-\rho UK$. **(15)**

L-2/T-2/NAME **Date : 31/07/2016**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

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

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

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**.

Symbols have their usual meaning.

1. (a) What are the advantages of using three phase AC power in a shipboard electrical power distribution system? What are the differences between earthed and insulated electrical system? **(8)**

   (b) What are the key components of a marine electrical system? Draw the simplified diagram of an onboard distribution system. Explain the differences between 'essential' and 'non-essential' services in an oceangoing vessel. **(12)**

   (c) Power system for a ship comprising two synchronous generators connected in parallel is shown in Fig. for Q. 1(c). **(15)**

   (i) If only load-1 is connected, determine the frequency at which the system is operating and also the power supplied by each generator.

   (ii) If both loads are connected, what will be the system frequency and the power supplied by each generator?

   (iii) After load-2 is connected, what action can be taken to restore the system frequency to its previous value without affecting the power sharing between the two generators? Explain with house diagram. Determine the new value of control parameters.

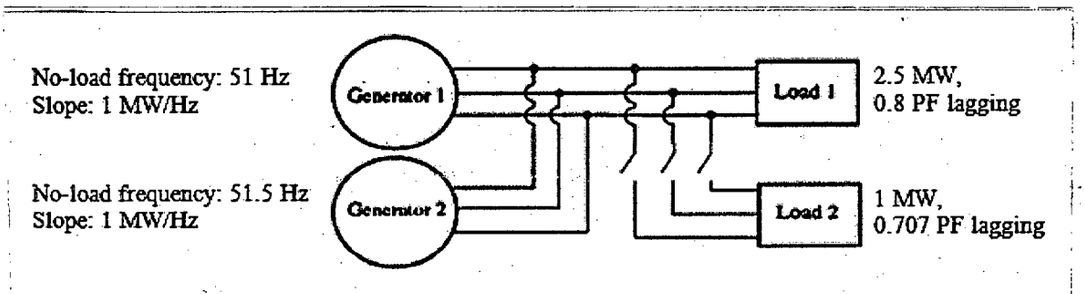

Fig. for Q. 1(c)

2. (a) Prove that, a three-phase set of currents injected to a three-phase set of coils produce a rotating magnetic field. **(12)**

   (b) What is synchronous speed? Why an induction motor cannot operate at synchronous speed? How can the speed of an induction motor be varied? **(8)**

Contd P/2

EEE 261/NAME

Contd ... Q. No. 2

(c) A two pole, 50-Hz induction motor supplies 15 kW to a load at a speed of 2940 rpm. The combined friction, windage and stray losses of the motor is given as 500 W. **(15)**

(i) What is the motor's slip?

(ii) What is the induced torque in the motor under these conditions?

(iii) How much power will be supplied by the motor if the induced torque gets doubled due to a change in load?

3. (a) Draw the torque-speed characteristics of an induction motor and a synchronous motor and explain their differences. **(8)**

(b) From the phasor diagram of a synchronous motor undergoing change of field current, derive the synchronous motor V curve. Explain its significance in power factor improvement. **(12)**

(c) A 400-V, 50-kVA, Δ-connected, 50 Hz synchronous machine has a synchronous reactance of 2.5 Ω and negligible armature resistance. Its friction and windage losses are 1.5 kW, core losses are 1.0 kW, and stray losses are 1% of the input power. **(15)**

(i) If the motor is operating at 0.8 pf leading and supplying a 15 hp load, what are the values of $\bar{I}_A$, and $\bar{E}_A$?

(ii) If the shaft load is now increased to 30 hp, what will be the values of $\bar{E}_A$ and $\bar{I}_A$? What is the new power factor of the motor?

4. (a) For a synchronous generator with negligible armature resistance, prove that, $P_{out} = \frac{3V_\phi E_A \sin\delta}{X_s}$; where the symbols have their usual meaning. **(7)**

(b) What is an infinite bus? Why must the oncoming generator have a higher frequency compared to the running system to operate in parallel? What are the other conditions for paralleling alternators? **(8)**

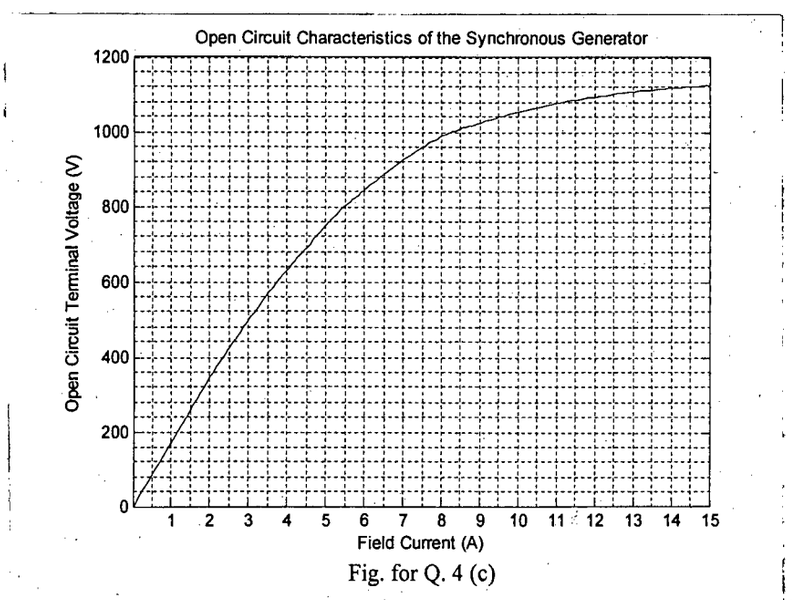

Fig. for Q. 4 (c)

Contd P/3

EEE 261/NAME

Contd ... Q. No. 4

(c) A 1000 V, 750 kVA, 60 Hz, four-pole, Δ-connected synchronous generator has a synchronous reactance of 0.5 Ω and negligible armature resistance. OCC curve of this generator is shown in Fig. for Q. 4(c). At 60 Hz, its friction and windage losses are 24 kW, and its core losses are 16 kW. **(20)**

(i) If the generator is connected to a load and the load draws rated current with a power factor of 0.8 lagging, how much field current will be required to keep the terminal voltage at rated value? Determine regulation and efficiency of the generator at rated condition.

(ii) If the current drawn by the load increases by 20% maintaining the same power factor and field current remains unchanged, what will be the voltage at the generator terminals? To restore the terminal voltage to its rated value, what should be the value of field current?

SECTION – B

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

5. (a) Draw the block diagram of a DC power supply. **(5)**

(b) In the circuit of Fig. for Q. No. 5(b), the input is a sinusoid with peak of 24 V. Assuming the diodes to be ideal, sketch the conduction path during the positive and negative half-cycles of the input. Determine and sketch the output voltage, v_0 assuming $R_L = 3R$. **(15)**

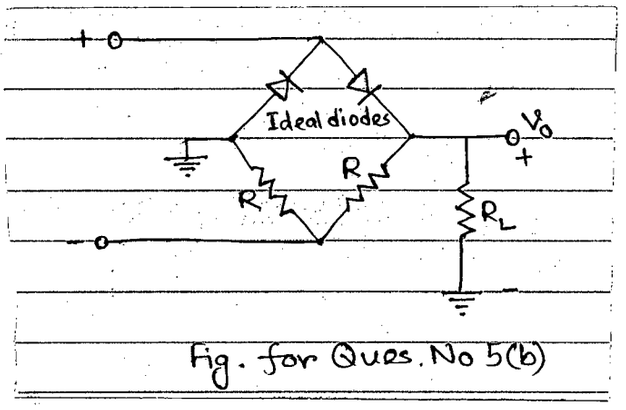

Fig. for Ques. No 5(b)

(c) For the circuit shown in Fig. for Q. No. 5(c), the input voltage varies between 30 V and 50 V. Determine the value of R_s and maximum Zener current, I_{ZM} that will maintain an output voltage of 20 V across the 1 kΩ resistor. **(15)**

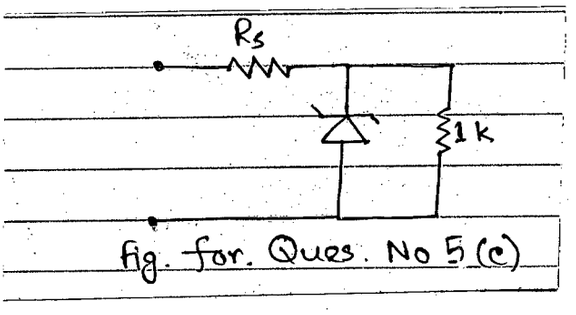

fig. for. Ques. No 5 (c)

Contd P/4

EEE 261/NAME

6. (a) In the circuit of Fig. for Q. No. 6(a), Q1 and Q2 are identical transistors with $\mu_n C_{ox} = 0.4$ mA/V^2, W/L = 5, $V_t = 0.6$ V. **(20)**

(i) Determine the value of R_1 that results in $V_{D1} = 0.8$ V.

(ii) Find the value of R_2 that results in Q2 operating at the edge of the saturation region.

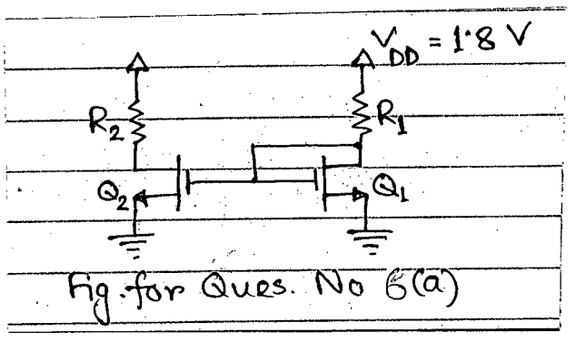

Fig. for Ques. No 6(a)

(b) The NMOS and PMOS transistors in Fig. for Q. No. 6(b) are matched with $k'_n (W_n/L_n) = k'_p (W_p/L_p) = 1$ mA/V^2 and $V_{tn} = -V_{tp} = 1$V. Find the drain currents and drain voltage for (i) $V_I = +2.5$ V; (ii) $V_I = -2.5$ V. **(15)**

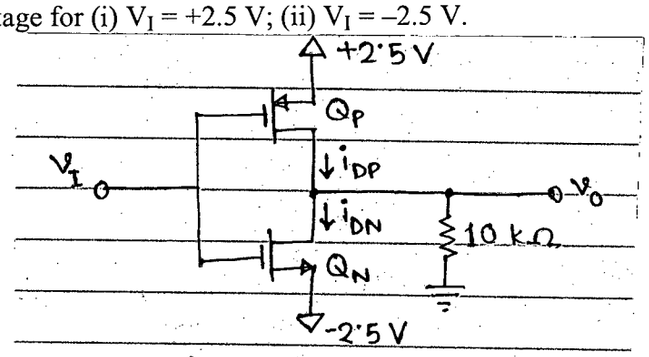

Fig. for Ques. No. 6(b)

7. (a) Draw the transfer characteristic of an n-p-n transistor operating in common emitter configuration. Explain how this transistor can be operated as a switch and an amplifier. What is the significance of Q point on signal amplification? **(15)**

(b) For the transistor in Fig. for Q. No. 7(b), β = 100. Determine: **(20)**

(i) all node voltages and branch currents when $V_B = 4$ V.

(ii) the highest voltage to which the base can be raised while transistor operates in the active mode.

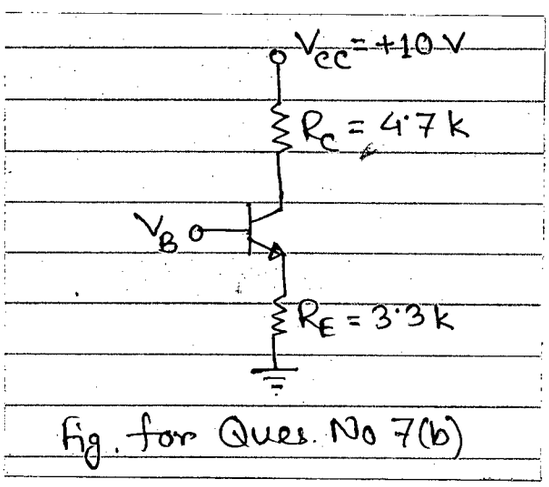

Fig. for Ques. No 7(b)

Contd P/5

EEE 261/NAME

8. (a) Draw the i-v characteristics of an SCR and explain the effect of gate pulse on its operating using a two transistor model. **(10)**

   (b) Draw the circuit diagram of a full wave, half-controlled bridge converter with a free wheeling diode and explain its operation. Sketch the waveforms of current through all components and also the load voltage. Find the expression of average and rms load voltage. **(25)**

L-2/T-2/NAME **Date : 06/08/2016**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

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

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

Full Marks : 210 Time : 3 Hours

The figures in the margin indicate full marks.

Symbols used 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 a partial differential equation by eliminating a, b, c from $\frac{x^2}{a^2}+\frac{y^2}{b^2}+\frac{z^2}{c^2}=1$. **(10)**

   (b) Solve the following PDE: **(12)**

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

   (c) Find complete, singular and general integrals of $(p^2+q^2)y = qz$. **(13)**

2. (a) Solve the following:

   (i) $\frac{\partial^3 z}{\partial x^3} - \frac{\partial^3 z}{\partial y^3} = x^3 y^3$ **(10)**

   (ii) $(D^2 - DD' - 6D'^2)z = e^{2y}\sin 3x$, where $D \equiv \frac{\partial}{\partial x}$, $D' \equiv \frac{\partial}{\partial y}$. **(12)**

   (b) Solve: $(r-s)x = (t-s)y$. **(13)**

3. (a) Show that every square matrix can be expressed in one and only one way as the sum of a symmetric and a skew-symmetric matrix. **(12)**

   (b) Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 7 & 3 & 5 \\ 3 & 8 & 1 & -2 \\ 2 & 4 & 6 & 8 \end{bmatrix}$ reducing it to the canonical form. **(12)**

   (c) Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 2 \\ 1 & 5 & 4 \end{bmatrix}$ by algebraic method. **(11)**

4. (a) Reduce $A = \begin{bmatrix} 1 & -2 & 1 & 3 \\ 4 & -1 & 5 & 8 \\ 2 & 3 & 3 & 2 \end{bmatrix}$ to the normal form B and compute the matrices P and Q such that PAQ = B, where A and B are equivalent matrices. **(18)**

   (b) For what values of λ and μ, the system **(17)**

   $$x + y + z = 6$$
   $$x + 2y + 3z = 10$$
   $$x + 2y + \lambda z = \mu$$

   has (i) no solution, (ii) unique solution and (iii) infinite solutions.

Contd P/2

MATH 283/NAME

SECTION – B

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

5. (a) You are given the following incomplete frequency distribution. The total frequency is 230, the median is 33.5 and the mode is 34. Estimate by calculation the missing frequencies. **(17)**

Class interval	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Frequency	04	16	?	?	?	06	04

(b) Calculate variance and coefficient of variation from the following table. **(18)**

Class interval	0–10	10–20	20–30	30–40	40–50	50–60
Frequency	08	12	20	30	20	10

6. (a) Calculate the first four moments about the point 120. Convert the result into moments about the mean. Compute the value of γ_1 and γ_2 and comment on the nature of the distribution. **(20)**

Class interval	50–70	70–90	90–110	110–130	130–150	150–170	170–190
Frequency	04	08	12	20	06	07	03

(b) Given the following values of two variables. **(15)**

X:	91	97	108	121	67	124	51	73	111	57
Y:	71	75	69	97	70	91	39	61	80	47

(i) Find the regression line of Y on X and predict Y if X = 100.

(ii) Find the regression line of X on Y and predict X if Y = 50.

7. (a) A manufacturer who produces medicine bottles, finds that 0.1% of the bottles are defective. The bottles are packed in boxes containing 500 bottles. A drug manufacturer buys 100 boxes from the producer of bottles. Using Poisson distribution, find how many boxes will contain: **(13)**

(i) No defective (ii) At least two defectives.

(b) 400 labourers were selected at random from a certain city. Their mean income was Tk. 1700 per month with a standard deviation of Tk. 140. Set up 95% confidence limit within which the income of the labour community of the district is expected to lie. **(11)**

(c) The mean lifetime of a sample of 100 light tubes produced by a company is found to be 1580 hours with standard deviation of 90 hours. Test the hypothesis that the mean lifetime of the tubes produced by the company is 1600 hours. **(11)**

8. (a) Find the Eigenvalues and Eigenvectors of the matrix $A = \begin{bmatrix} 4 & 6 & 6 \\ 1 & 3 & 2 \\ -1 & -4 & -3 \end{bmatrix}$. Also find the matrix P that diagonalizes A and determine $P^{-1}AP$. **(18)**

(b) Reduce the quadratic form $x_1x_2 + x_1x_3 + x_1x_4 + x_2x_3 + x_2x_4 + x_3x_4$ to the canonical form and hence determine its rank. **(17)**
