5th Sem. (1)

Tribhuvan University
Institute of Science and Technology
2076

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Subject: **Financial Accounting** *Full Marks*: 45
Course No: **MSAC 301** *Pass Marks*: 18
Level: **B. Math. Sc. /III Year /V Semester** *Time*: 2hrs

Candidates are required to give their answer in their own words as far as practicable.

Attempt ALL Questions.

Group A [5 × 3 = 15]

1. Explain about Money measurement concept and Accounting period concept with its examples.
2. Describe reserve with its importance.
3. Discuss the inventory management with its importance.
4. Following information are provided:
   Current ratio is 2.5:1, gross profit margin 30%, debtors Rs.1,50,000, stock Rs.100,000 and inventory turnover ratio is 5 times.
   Required: a) Amount of sales b) Debtor s turnover ratio c) Current liabilities
5. Describer the ways that manipulated to create false impression of a company's financial position.

Group B [5 × 6 = 30]

6. Explain the purpose of management information system in the modern business era with its importance.
7. The trial balance of CT Insurance company ltd on 31st December 2019 is given:

Particular	Dr. (Rs.)	Cr. (Rs.)
Equity share capital		2,20,000
Share premium		22,000
Sales		4,00,000
Purchases	3,00,000	
Wages	20,000	
Cash at bank	10,000	
Salaries	20,000	
Fixed assed	2,00,000	
Investment	1,00,000	
Creditors		28,000
Debtors	40,000	
Insurance premium	10,000	
Interest and dividend received		30,000
Total	**7,00,000**	**7,00,000**

Additional information:

a) Depreciation on fixed assed by 10%
b) Wages outstanding Rs. 6,000
c) Prepaid insurance Rs. 3,000
d) Closing stock Rs.20,000

Required:

- Income statement of CT insurance Company Ltd.
- Balance sheet of CT insurance Company Ltd.

OR

Explain the importance of Forecasting and Budgeting in an organization.

8. What is company? Describe the features of company.

9. The balance sheet of a company as on 31st December 2019 is given below:

Liabilities	Year I Rs.	Year II Rs.	Assets	Year I Rs.	Year II Rs.
Share capital	7,50,000	9,00,000	Fixed assets	7,50,000	10,50,000
8% debenture	1,50,000	75,000	Inventory	60,000	1,20,000
Retained earning	1,50,000	2,25,000	Sundry	3,15,000	2,55,000
Sundry creditors	1,50,000	2,00,000	debtors	1,50,000	75,000
Outstanding expenses	75,000	1,00,000	Cash balance		
Total	**12,75,000**	**15,00,000**	**Total**	**12,75,000**	**15,00,000**

Additional information:

a) Sales amount RS. 10,50,000
b) Cost of goods sold Rs. 6,60,000
c) Operating expenses Rs. 1,50,000
d) Purchased of fixed assets Rs. 4,80,000
e) Fixed assets sold Rs. 1,05,000
f) Dividend distributed for the year Rs. 90,000

Required: Cash Flow Statement of Company.

OR

Explain the importance of cash flow statement business organization.

10. **The following information given to you:**

Earnings before interest and tax ..... Rs. 1,00,000
10% preference share capital ..... Rs 50,000
Equity share capital 1000shares@Rs 100 each ..... Rs. 1,00,000
Market price per share Rs.150
Dividend paid to equity shareholders ..... Rs. 20,000
Tax rate 50%
Total assets ..... Rs. 3,00,000

Required:

a) Earnings per share
b) Dividend per share
c) Dividend payout ratio
d) Dividend yield ratio
e) Earning yield ratio
f) price earnings ratio

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2076

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5th sem. (2)

Subject: **Actuarial Model I** *Full Marks*: 45
Course No: **MSAS 301** *Pass Marks*: 18
Level: **B. Math. Sc. /III Year /V Semester** *Time*: 2hrs

Candidates are required to give their answer in their own words as far as practicable.

Attempt ALL Questions.

Group A **[5 × 3 = 15]**

1. Discuss the following statement:
The existence of fund managers who sell their services based on their alleged ability to select over-performing sectors and stocks and so add value to portfolios demonstrates that capital markets are not efficient.

2. A financial advisory company is conducting a survey to check applicability of behavioral finance theories to a particular population and has devised the following questionnaire. According to you which theme of behavioral finance is the advisory trying to survey by asking each of the following questions?
   a) Would a prior investment decision that resulted in a loss stop you from making a similar decision, even if the new investment appears to be the best alternative?
   b) How frequently do you review your investment portfolio?
   c) A popular analyst has commented that markets are expected to provide returns in excess of 15% in the coming year. Will you invest in equities with a hope to earn at least 15% for next year?

3. An investor can construct a portfolio using only two assets X and Y. The statistical properties of the two assets are shown below:

	X	*Y*
Expected return	4%	6%
Variance of return	6%	12%

The correlation coefficient between assets X and Y is 0.5. Assuming that the investor cannot borrow to invest:
   a) Determine the composition of the portfolio which will give the investor the highest expected return.
   b) Calculate the composition of the portfolio which will give the investor the minimum variance.

4. A stochastic model of investment returns assumes that the annual rates of return in different years are independent and identically distributed normal random variables with mean 8% and standard deviation 2%. Calculate the mean and standard deviation of the accumulated value, at time 2, of an initial investment of £10,000.

5. State the limitations of the CAPM.

Group B **[5 × 6 = 30]**

6. a) Explain the four axioms that are required to derive the expected utility theorem.
   b) A risk averse investor makes decisions using a quadratic utility function: $U(w) = w + dw^2$. Derive an upper bound for d for this investor.
   c) By considering the relationship $R(w) = w \times A(w)$, explain which of the following statements is true for a risk-averse individual:
   i) If an investor's preferences display decreasing relative risk aversion then they must also display decreasing absolute risk aversion.
   ii) If an investor's preferences display decreasing absolute risk aversion then they must also display decreasing relative risk aversion.

7. List the key advantages and disadvantages of the following measures of investment risk in the context of a portfolio of bonds subject to credit risk:

a) Variance of returns
b) Downside semi-variance of Return
c) Shortfall probability
d) Value at Risk
e) Tail Value at Risk

OR

An investor is contemplating an investment with a return of £ R, where: R = 250,000 – 100,000N and N is a Normal [1,1] random variable. Calculate each of the following measures of risk:

a) variance of return;
b) downside semi-variance of return;
c) shortfall probability, where the shortfall level is £50,000;
d) Value at Risk at the 95% confidence level

8. Consider the following three-factor model of security returns:

$R_i = \alpha_i + \beta_{i1}I_1 + \beta_{i2}I_2 + \beta_{i2}I_3 + \varepsilon_i$

Where: R_i is the return on security i

α_i, β_{i1}, β_{i2} and β_{i3} are security-specific parameters

I_1, I_2 and I_3 are the changes in the three factors on which the model is based; and

ε_i are independent random normal variables, each with variance σ^2

a) Describe three categories of model that could be used to help choose the factors I_1, I_2 and I_3.
b) List examples of the variables that could be used for the factors I_1, I_2 and I_3, for two of these three categories of model.

9. Claim events on a portfolio of insurance policies follow a Poisson process with parameter λ. Individual claim amounts follow a distribution X with density

$$f(x) = 0.01^2 x e^{-0.01x}; \quad x > 0$$

The insurance company calculates premiums using a premium loading of 45%.

a) Derive the moment generating function $M_X(t)$
b) Determine the adjustment coefficient and hence derive an upper bound on the probability of ruin if the insurance company has initial surplus U.
c) Find the surplus required to ensure the probability of ruin is less than 1% using the upper bound in (b).

10. a) Write down the general form of a statistical model for a claims run-off triangle, defining all terms used

b) The table below shows cumulative claims paid on a portfolio of motor insurance policies.

	Development Year			
AY	0	1	2	3
2007	120	134	146	148
2008	140	180	185	
2009	135	149		
2010	138			

All claims are fully run off by the end of development year 3.

Calculate the total reserve for outstanding claims using the basic chain ladder technique.

OR

The table below shows the incremental claims incurred for a certain portfolio of insurance policies.

	Development Year		
AY	0	1	2
2011	2233	1389	600
2012	3380	1808	
2013	4996		

Cumulative numbers of claims are shown in the following table:

	Development Year		
AY	0	1	2
2011	140	203	224
2012	180	230	
2013	256		

Calculate the outstanding claim reserve for this portfolio using the average cost per claim method with grossing up factors

5th Sem. (3)

Tribhuvan University
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2076

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Subject: **Financial Institutions**
Course No: **MSFI 301**
Level: **B. Math. Sc. /III Year /V Semester**

Full Marks: 45
Pass Marks: 18
Time: 2hrs

Candidates are required to give their answer in their own words as far as practicable.

Attempt ALL Questions.

Group A **[5×3=15]**

1. Who are the major participants of Treasury bills transaction?
2. What are the components of formal financial system?
3. You are given following data

Stock	Day 1	Day 2
A	Rs. 600	Rs. 6600
B	Rs. 1500	Rs. 1400
C	Rs. 1400	Rs. 1550

In both days, there are 100 shares of stock A, 200 shares of stock B, and 100 shares of stock C outstanding.

a) Construct a price-weighted market index using three stocks A, B and C. What is the index's value on day 1?
b) What is the price-weighted index's value on day 2?
c) Construct a value-weighted index using the three stocks. Assign the value-weighted index a value of 100 on day 1. What is the index's value on day 2?

4. Consider following information of Treasury bill quotation:

Maturity	Days to Mat	Bid	Ask	Change	Ask Yld
28/05/20	150	4.45	4.30	–0.02	4.44

a) When does the bill mature and at what yield rate do investors can buy this bill today?
b) Explain the difference in the 'Bid' and Ask quotes. Is bid yield is always greater than ask yield?
c) What does change of –0.02 mean? Calculate the bid yield of previous day.

5. How derivatives are criticized?

Group B **[5×6=30]**

6. Discuss about the role of cooperatives in economic development of Nepal?
7. What is derivative security? Mention about different types of derivative securities.
8. What do you mean by repo and reverse repo? For what purpose NRB uses these instruments?
9. Highlight the major provisions regarding listing of shares in NEPSE as per the Securitas Listing and Trading Rule 2075?

OR

Solve the following:

a) The investor buys a new 12-month T-bill at a discount rate of 7.5 percent. Sixty days later, the bill is sold at a price that results in a discount rate of 7 percent. Calculate investor's holding period return.

b) A bank has issued a 6-month, Rs 1 million negotiable CD with a 4 percent annual interest rate. How much of amount of interest will earned by depositor at the end of 6-months period? How much of amount in six months in exchange the depositor receive for Rs 1 million deposited in the bank today? Immediately after the CD is issued, the market rate on the Rs 1 million CD rises to 4.6 percent. What is the secondary market price of this CD?

c) The auction price for a treasury bill is Rs 970 on aRs 1,000 par value and the bill matures in 91 days. Find discount yield and bond equivalent yield on T-bill.

10. What is micro insurance? Describe the importance of micro insurance in Nepalese context.

OR

Suppose an employee with 20 years of service at a company is considering retirement at some point in the next 10 years. His career average salary and average salary during past 3 years are given below:

Years worked	career average salary	Average salary during last three years of service
20	32000	Rs 40,000
25	37000	47,000
30	44000	50,000

Calculate his annual pension amount for retirement today, in five years and in 10 years if company uses

a) Flat benefit formula using flat amount of Rs 1000.
b) Career average formula under which employee receives pension of 3.5 percent of career average salary times the years of service.
c) Final pay formula under which annual payout is 2.5 percent of the average salary over the employees' last three years of service times the total years employed.
d) Do pension methods explained here are defined-contribution plan? Why or why not?

Tribhuvan University
Institute of Science and Technology
2076

5th Sem! (4)

Subject: **Financial Mathematics I** *Full Marks*: 45
Course No: **MSMT 301** *Pass Marks*: 18
Level: **B. Math. Sc. /III Year /V Semester** *Time*: 2hrs

Candidates are required to give their answer in their own words as far as practicable.
Attempt ALL Questions.

Group A **[5 × 3 = 15]**

1. The force of interest, $\delta(t)$, is a function of time and at any time t, measured in years, is $a + bt$ where a and b are constants. An amount of £45 invested at time $t = 0$ accumulates to £55 at time $t = 5$ and £120 at time $t = 10$.
   a) Calculate the values of a and b.
   b) Calculate the constant force of interest per annum that would give rise to the same accumulation from time $t = 0$ to time $t = 10$.

2. The rate of interest is 4.5% per annum effective. Calculate
   i) the annual effective rate of discount.
   ii) the nominal rate of discount per annum convertible monthly.
   iii) the nominal rate of interest per annum convertible quarterly.
   iv) the effective rate of interest over a five year period.
   Explain why your answer to part (ii) is higher than your answer to part (i).

3. A loan is to be repaid by an annuity payable annually in a year. The annuity starts at a rate of £300 per annum and increases each year by £30 per annum. The annuity is to be paid for 20 years. Repayments are calculated using a rate of interest of 7% per annum effective. Calculate
   a) The amount of the loan.
   b) The capital outstanding immediately after the 5th payment has been made.
   c) The capital and interest components of the final payment.
   d) An investor purchases a bond 6 months after issue. The bond will be redeemed at 105% eight years after issue and pay coupons of 4% per annum in arrears. The investor pays tax of 25% on income and 15% on capital gain.

4. An investor purchases a bond 6 months after issue. The bond will be redeemed at 105% eight years after issue and pay coupons of 4% per annum in arrears. The investor pays tax of 25% on income and 15% on capital gain.Calculate the purchase price of the bond per $100 nominal to provide the investor with a rate of return of 5% per annum effective.

5. Explain Net Present Value and Internal Rate of Return in respect to their appropriateness in appraising projects.

Group B **[5 × 6 = 30]**

6. On 15 May 2017, the government of a country issued an index-linked bond of term 10 years. Coupons are payable half-yearly in arrears, and the annual nominal coupon rate is 8%. The nominal redemption price is 102%.Coupon and redemption payments are indexed by reference to the value of a retail price index with a time lag of 6 months. The retail price index value in November 2016 was 185 and in May 2017 was 190.
   The issue price of the bond was such that, if the retail price index were to increase continuously at a rate of 2% pa from May 2017, a tax exempt purchaser of the bond at the issue date would obtain a real yield of 3% pa convertible half-yearly. Show that the issue price of the bond is £146.85 per £100 nominal.

OR

An insurance company borrows £50 million at an effective interest rate of 9% per annum. The insurance company uses the money to invest in a capital project that pays £6 million per annum payable half-yearly in arrears for 20 years. The income from the project is used to repay the loan. Once the loan has been repaid, the insurance company can earn interest at an effective interest rate of 7% per annum.

a) Calculate the discounted payback period for this investment.

b) Calculate the accumulated profit the insurance company will have made at the end of the term of the capital project.

7. The force of interest, $\delta(t)$, is a function of time and at any time t, measured in years, is given by the formula:

$$\delta(t) = \begin{cases} 0.03 & \text{for } 0 < t \le 10 \\ 0.003t & \text{for } 10 < t \le 20 \\ 0.0001t^2 & \text{for } t > 20 \end{cases}$$

a) Calculate the present value of a unit sum of money due at time $t = 28$.

b) Calculate the equivalent constant force of interest from $t = 0$ to $t = 28$.

c) Calculate the equivalent annual effective rate of discount from $t = 0$ to $t = 28$.

A continuous payment stream is paid at the rate of $e^{-0.04t}$ per unit time between $t = 3$ and $t = 7$

d) Calculate the present value of the payment stream.

OR

List the advantage and disadvantage of using models in actuarial work.

A new town is planned in a currently rural area. A model is to be developed to recommend the number and size of schools required in the new town. The proposed modelling approach is as follows:

a) The current age distribution of the population in the area is multiplied by the planned population of the new town to produce an initial population distribution.

b) Current national fertility and mortality rates by age are used to estimate births and deaths.

c) The births and deaths are applied to the population distribution to generate a projected distribution of the town's population by age for each year, and hence the number of school age children.

Discuss the appropriateness of the modelling approach.

8. On 1 January 2016, a student plans to take out a five-year bank loan for £30,000 that will be repayable by installments at the end of each month. Under this repayment schedule, the installment at the end of January 2016 will be X, the installment at the end of February 2016 will be 2X and so on, until the final installment at the end of December 2020 will be 60X. The bank charges a rate of interest of 15% per annum convertible monthly.

a) Prove that

$$(Ia)_{\overline{n}|} = \frac{\ddot{a}_{\overline{n}|} - nv^n}{i}.$$

b) Show that X=£26.62

The student is concerned that she will not be able to afford the later repayments and so she suggests a revised repayment schedule. The student would borrow £30,000 on 1 January 2016 as before. She would now repay the loan by 60 level monthly installments of 36X = £958.32 but the first repayment would not be made until the end of January 2019 and hence the final installment is paid at the end of December 2023.

c) Calculate the APR on the revised loan schedule and hence determine whether you believe the bank should accept the student's suggestion.

d) Explain the difference in the total repayments made under the two arrangements.

9. Exactly three months ago an investor purchased an office building for £5.8 million with the intention of renting it out. In three months' time the investor will spend £850,000 on necessary refurbishments and improvements.A tenant has agreed to lease the building in six months' time for 35 years. The tenant will pay an initial rent of £1.250 million per annum payable monthly in arrear. The rent will be increased at five-yearly intervals at a rate of 4.2% per annum compound. It has further been agreed that at the end of the lease period the tenant will buy the building from the investor for £11.5 million.The investor pays income tax at a rate of 35% and is expecting a net effective rate of return of 8% per annum.Calculate, showing all workings, the net present value of the project to the investor at the time of purchase.

10. A pension fund has liabilities to meet annuities payable in arrear for 40 years at a rate of £10 million per annum. The fund is invested in two fixed-interest securities. The first security pays annual coupons of 5% and is redeemed at par in exactly ten years' time. The second security pays annual coupons of 10% and is redeemed at par inexactly five years' time. The present value of the assets in the pension fund is equal to the present value of the liabilities of the fund and exactly half the assets are invested in each security. All assets and liabilities are valued at a rate of interest of 4% per annum effective.

a) Calculate the present value of the liabilities of the fund.

b) Calculate the nominal amount held of each security purchased by the pension fund.

c) Calculate the duration of the liabilities of the pension fund.

d) Calculate the duration of the assets of the pension fund.

e) Without further calculations, explain whether the pension fund will make a profit or loss if interest rates fall uniformly by 1.5% per annum effective.

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5th Sem. (5)

त्रिभुवन विश्वविद्यालय
विज्ञान तथा प्रविधि अध्ययन संस्थान
अन्तिम परीक्षा-२०७६

विषय: नेपाली साहित्य
विषय सङ्केत: MSNE 301
तह: बि.ग्याच.एस्सी./तेस्रो वर्ष/पाँचौं सेमेस्टर

✡

पूर्णाङ्क : ४५
उत्तीर्णाङ्क : १८
समय : २ घण्टा

विद्यार्थीहरूले सकेसम्म सिर्जनात्मक रूपमा आफ्नै शब्दशैलीमा उत्तर दिनुपर्नेछ ।

सबै प्रश्नको उत्तर दिनुहोस् ।

समूह क [५×३=१५]

१. कोभिड-१९ महामारी रोगका बारेमा जनतालाई सचेत गराउन र सावधानी अपनाउन जानकारी दिन स्वास्थ्य मन्त्रालय, स्वास्थ्य विभागका तर्फबाट प्रकाशित गर्ने सार्वजनिक सूचनाको नमूना लेख्नुहोस् ।

२. तल दिइएका अनुच्छेदको सूचनालाई तालिकामा रूपान्तरण गरी लेख्नुहोस् :
गणित विज्ञान स्कुल, बल्खुमा २०७६ मा अध्ययनरत विद्यार्थीको विवरणलाई केलाउँदा पहिलो सत्रमा १३ छात्र र २३ छात्रासहित ३६, दोस्रोदेखि सातौं सत्रमा छात्रहरु क्रमशः १४, १६, १८, ९, २० र १४ तथा छात्राहरु क्रमशः २०, १९, १७, १५, १६ र १९ गरी यी सत्रमा ३४, ३५, ३५, २४, ३६ र ३३ सहित कूल२३३ विद्यार्थी छन् । सबैभन्दा बढी पहिलो र छैटौं सत्रमा ३६,३६ जना छन् भने सबैभन्दा कम पाँचौं सत्रमा २४ जना छन् । बाँकीमा औसत संख्या राम्रै छ ।

३. यात्री कविताका माध्यमले नेपाली प्रकृतिका कस्ता विशेषता औल्याई जीवनयात्राको मर्म खुलाइएको छ ?

४. **प्रभु माइला** कथाले केकस्ता सामाजिक प्रवृत्तिप्रति व्यङ्ग्य प्रहार गरेको छ ?

५. **एक पत्र-सम्पादकलाई** निबन्धमा प्रकाशन स्वतन्त्रताप्रति कस्तो व्यङ्ग्य गरिएको छ ? लेख्नुहोस् ।

समूह ख [५×६=३०]

६. **मसान** नाटकमा पुरुषका प्रवृत्ति र नारी अस्तित्वको केकस्तो मनोभावनात्मक रहस्योद्घाटन गरिएको छ ? विश्लेषणात्मकप्रतिक्रिया दिनुहोस् ।

७. **विमाङ्कीय विज्ञान** को भविष्यबारे विभिन्न सरकारी कार्यालय, बैंक र निजी औद्योगिक प्रतिष्ठानहरुको अध्ययन भ्रमण र अन्तर्क्रियात्मक कार्यक्रमको विवरण समेटी एउटा प्रतिवेदन तयार गर्नुहोस् ।

अथवा

एक्चुरियल विज्ञान को अध्ययन :सम्भावना र चुनौति शीर्षकमा ३०० शब्दमा नघटाई निबन्ध लेख्नुहोस् ।

८. **हेब्बी बड्डे** कविताले कस्तो सामाजिक जीवनको चित्रण गरेको छ ? समीक्षात्मक प्रतिक्रिया लेख्नुहोस् ।

अथवा

पागल कवितामा केकस्ता सामाजिक र मानवीय प्रवृत्तिप्रति व्यङ्ग्य गरिएको छ ?

९. तलको अनुच्छेद पढी अन्त्यमा सोधिएका प्रश्नको छोटोमिठो उत्तर लेख्नुहोस् :
... सानो, मिठो, शान्त, सुगन्धी, अनुपम बस्! मेरा निमित्त त्यही हे नेपाल ! ... । ...निला पहाडहरुको प्राकृतिक भाषा, झरनाहरु घुसेका मिठा लवज, हिमालयको झल्का पसेका शब्द, अमरबल्लरीहरु ढल्केका बाइमात्रा, चराचुरुङ्गीसँग उड्ने र बोल्ने अक्षरहरु, । मेरो भाषा ज्यादा नफैलेको होस्, तर मेरो इन्द्राणीको झर्ना यही हो । .....ज्ञान विवेकको अँधेरीमा पाइन्न । विज्ञानभन्दा ज्ञान मूल्यवान् छ । ... अन्धविश्वास भन्नेले आफ्नो अन्धविश्वास उपर आँखा चिम्लिरहेछ , तर हाइ ! हाइ ! नेपाली हृदय! तँभन्दा सुन्दर, शान्त, सजीव कुरा संसारमा के होला !

प्रश्नहरु :

क) यो अनुच्छेदमा नेपालका कस्ता विशेषताको उल्लेख गरिएको छ ?
ख) कस्ता विशेषताको चर्चा गरी नेपाली भाषाको महिमागान गरिएको छ ?
ग) प्राकृतिक, हिमालय र अनुपम शब्दको निर्माणप्रक्रिया देखाउनुहोस् ।
घ) दिइएको गद्यखण्डको मुख्य भाव के हो ?

१०. सिपाही कथाले कस्तो मानवीय मनोवैज्ञानिक भावनाको चित्रण गरेएको छ ?समीक्षात्मक प्रतिक्रिया दिनुहोस् ।