KATHMANDU UNIVERSITY
End Semester Examination
February/March, 2019

Mark Scored:

Level : B. E. / B. Sc. / B. Pharm. / B. Tech. | Course : MGTS 301
Year : III | Semester : I
Exam Roll No. : | Time: 30 mins. | F. M. : 20
Registration No.: | Date : 03 MAR 2019

SECTION "A"
[20 Q. × 1 = 20 marks]

Encircle the most appropriate answers from the given choices.

1. A foreman supervises A, B and other eight employees. The foreman states that he spends twice as much time supervising A and half as much time supervising B, compared with the average time spent supervising his other subordinates. All employees have the same production rate. On the basis of equal cost per unit production, what monthly salary is justified for B if the foreman gets Rs. 3,800 per month and A gets Rs. 3,000 per month?
a. Rs. 3,543 b. Rs. 3,800 c. Rs. 3,000 d. Rs. 2,457

2. An automatic process controller will eliminate the current manual control operation. Annual cost of the current method is Rs. 4,000. If the controller has a service life of 13 years and an expected market value of 11% of first cost, what is the maximum economical price for the controller? Ignore interest.
a. Rs. 28,869 b. Rs. 58,426 c. Rs. 26,358 d. Rs. 25,694

3. Which of the following is not the principle of engineering economy?
a. Develop the alternative
b. Focus on the difference
c. Use a common unit of measure
d. Development of problems

4. Which of the following is not included in the basic format of Nominal Group Technique (NGT) session?
a. Individual silent generation of ideas
b. Individual round-robin feedback and recording of ideas
c. Group clarification of each idea
d. Prioritize ideas based on ranking done by facilitator

5. Suppose that Jack College finds a motorcycle he likes and pays Rs. 20,000 as a down payment, which will be applied to the Rs. 150,000 purchase price, but which must be forfeited if he decides not to take the cycle. Over the weekend, Jack finds another motorcycle he considers equally desirable for a purchase price of Rs. 120,000. If Jack purchase motorcycle at Rs. 120,000, what is the sunk cost?
a. Rs. 170,000 b. Rs. 20,000 c. Rs. 30,000 d. Rs. 120,000

6. A company produces and sells a consumer product and is able to control the demand for the product by varying the selling price. The approximate relationship between price and demand is p=Rs. $38 + 2{,}700/D - 5{,}000/D^2$, for $D > 1$, where p is the price per unit in Rupees and D is the demand per month. The company is seeking to maximize its profit. The fixed cost is Rs. 1,000 per month and the variable cost (cv) is Rs. 40 per unit. What is the number of units that should be produced and sold each month to maximize profit?
a. 50 units b. 60 units c. 70 units d. 80 units

7. Which of the following is an example of book cost?
   a. Material cost b. Labor cost c. Depreciation d. Electricity charge

8. A given rate is quoted as 12% APR, but has an effective annual rate (EAR) of 12.55%. What is the frequency of compounding during the year?
   a. Annually b. Semiannually c. Quarterly d. Monthly

9. Dale Dai wishes to save money to provide for his retirement. Beginning one year from now, he will begin depositing the same fixed amount each year for the next 30 years into a retirement savings account. Starting one year after making his final deposit, he will withdraw Rs. 100,000 annually for each of the following 25 years (i.e. he will make 25 withdrawals in all). Assume that the retirement fund earns 12% annually over both the period that he is depositing money and the period he makes withdrawals. In order for Dale Dai to have sufficient funds in his account to fund his retirement, how much should he deposit annually (rounded to the nearest Rs.)?
   a. Rs. 97,368 b. Rs. 2,902 c. Rs. 3,250 d. Rs. 2,730

10. You decide to put Rs.10,000 in a money market fund that pays interest at the annual rate of 7.2% and compounding it monthly. You plan to take the money out after one year and pay the income tax on the interest earned. You are in the 25% tax bracket. Find the total amount that you will get after tax.
    a. Rs. 10,558.18 b. Rs. 11,558.18 c. Rs. 12,855.18 d. Rs. 15,580.18

11. Which technique is used to evaluate the capital budgeting project to avoid the drawback of internal rate of return?
    a. Payback period b. External rate of return
    c. Net present value d. Discounted payback period

12. You want to deposit enough money in a bank account for your son's education. You estimate that he will need Rs. 8,000 per year for four years, starting on his 18th birthday. If you earn 12% interest, how much lump sum should you deposit in the bank today to provide for his education?
    a. Rs. 24,298 b. Rs. 3,358 c. Rs. 32,000 d. Rs. 3,963

13. An amount F is accumulated by investing a single amount P for n compounding periods with interest rate of i. Select the formula that relates P to F.
    a. $P=F(1+i)^{-n}$ b. $P=F(1+i)^{n}$ c. $P=F(1+i)^{-I}$ d. $P=F(1+ni)^{-1}$

14. How large a contribution is required to endow perpetually a research laboratory which requires Rs. 500,000 for original construction, Rs. 200,000 per year for operating expenses and Rs. 100,000 every three years for new and replacement equipment? Interest rate is 4%.
    a. Rs. 700,000 b. Rs. 6,300,000 c. Rs. 7,900,000 d. Rs. 10,000,000

15. A drill press is purchased for Rs. 10,000 and has estimated life of twelve years. The salvage value at the end of twelve years is estimated to be Rs. 1,300. Using general straight line depreciation, compute the book value of the drill press at the end of eight years.
    a. Rs. 1,300 b. Rs. 3,333 c. Rs. 3,475 d. Rs. 4,200

16. A grading contractor owns earth-moving equipment that costs Rs. 300,000 and has a life of 7 years. After seven years of use, its salvage value will be Rs. 50,000. Using the general straight line method, compute the first two depreciation deductions and the book value at the end of four years.
    a. Rs. 35,714; Rs. 35,714; Rs. 157,143
    b. Rs. 85,714; Rs. 85,714; Rs. 0
    c. Rs. 21,429; Rs. 42,857; Rs. 150,000
    d. Rs. 42,857; Rs. 73,469; Rs. 93,711

17. Each member of a three-person filed crew is paid Rs. 20 per year. The same work could be done by a Hydro-Swift that costs Rs. 100,000 and is operated by one person who would be paid Rs. 30 per hour. Assume that the life of the Hydro-Swift is five years and that there are 1500 hours of field work per year. Minimum attractive rate of return is 20%. Compute the benefit-cost ratio of the Hydro-Swift.
    a. Cannot be determined since there is no annual cost
    b. 0.7
    c. 1.3
    d. 2.25

18. The period of time that results in the minimum equivalent uniform annual cost of and operating of assets is called:
    a. Economic life b. Ownership life c. Physical life d. Useful life

19. Government project that is expected to earn direct revenues sufficient to repay its cost in a specified period of time is called:
    a. Mutually exclusive project b. Independent project
    c. Multiple purpose project d. Self liquidating project

20. If EUCA of a laptop for first year is Rs. 430,000, EUAC for second year is Rs. 420,000; EUAC for third year is Rs. 473,000, what is the economic life of the laptop?
    a. Year 0 b. Year 1 c. Year 2 d. Year 3

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SECTION "B"

Attempt *ALL* the questions. Missing parameters can be assumed suitably.

1. a. Automobile repair shops typically recommend that their customers change their oil and oil filter every 3,000 miles. Your automobile user's manual suggests changing your oil every 5,000-7,000 miles. If you drive your car 15,000 miles each year and an oil and filter change costs Rs. 30, how much money would you save each year if you had this service performed every 5,000 miles? [3]

OR

What are the differences between potential alternatives and feasible alternatives? [3]

b. A plant operation has fixed costs of Rs 30,000,000 per year, and its output capacity is 2,000,000 electrical appliances per year. The variable cost is Rs. 50 per unit, and the product sells for Rs. 95 per unit. [3]

i. Construct the economic breakeven chart.
ii. Compare annual profit when the plant is operating at 80 of capacity with the plant operation at 100% capacity. Assume that the first 80% of capacity output is sold at Rs. 95 per unit and that the remaining 20% of production is sold at Rs. 80 per unit.

c. The purchase price of a natural gas-fired commercial boiler (capacity X) was Rs. 181,000 eight years ago. Another boiler of the same basic design, except with capacity 1.42X, is currently being considered for purchase. If it is purchased, some optional features presently costing Rs. 28,000 would be added for your application. If the cost index was 162 for this type of equipment when the capacity X boiler was purchased and is 221 now, and the applicable cost capacity factor is 0.8, what is your estimate of the purchase price for the new boiler? [4]

2. a. Suppose a bank offers loan with quoted or nominal interest of 16% per year. If you take a loan of Rs. 500,000 what will be the total amount to be paid at the end of 1 year in the following conditions:

i. If interest is continuously compounded.
ii. If interest is quarterly compounded.
iii. Which scheme would you choose as a borrower of funds? [3]

b. A large electronic retailer is considering the purchase of software that will minimize shipping expenses in its supply chain network. This software including installation, and training, would be Rs. 10 million investment for the retailer. If the firm's effective interest rate is 15% per year and the life of the software is four years, what annual savings in shipping expenses must be there be to justify the purchase of the software? [3]

c. A firm is considering which of two mechanical devices to install to reduce costs in a particular situation. Both devices cost Rs. 1,000,000 and have useful lives of 5 years and no salvage value. Device **A** can be expected to result in Rs. 300,000 savings annually. Device **B** will provide savings of Rs. 400,000 the first year but will decline Rs. 50,000 annually making the second-year savings Rs. 350,000 the third-year savings Rs. 300,000 and so forth. With interest at 7%, which device should the firm purchase? [4]

OR

A person has made an arrangement to borrow Rs. 1,000,000 and another Rs. 1,000,000 two years hence. The entire obligation is to be repaid at the end of four years. If the projected interest rates in years one, two, three and four are 10%, 12%, 12% and 14% respectively, how much will be repaid as a lump sum amount at the end of four years? [4]

3. a. The following information is provided for five mutually exclusive alternatives that have 20-year useful lives. If the minimum attractive rate of return is 12%, which alternative should be selected? Use incremental rate of return method. [5]

	Alternative				
	A	B	C	D	E
Cost	Rs. 4,000	Rs. 2,000	Rs. 6,000	Rs. 1,000	Rs. 9,000
Annual Benefit	639	410	761	117	785
PW of Benefit	7,330	4,700	8,730	1,340	9,000
Rate of Return	15%	20%	11%	10%	6%

OR

Evaluate machine XYZ on the basis of the PW method when the MARR is 12% per year. Pertinent cost data are as follows: [5]

Investment Cost	Rs. 13,000,000
Useful life	15 years
Market value	Rs. 3,000,000
Annual operating expenses	Rs. 100,000
Overhaul cost at the end of 5^{th} year	Rs. 200,000
Overhaul cost at the end of 10^{th} year	Rs. 550,000

b. Two electric motors are being considered to drive a centrifugal pump. One of the motors must be selected. Each motor is capable of delivering 60 horse power (output) to the pumping operation. It is expected that the motors will be in use 800 hours per year. The following data are available:

	Motor A	Motor B
Capital investment	Rs. 1,200,000	Rs. 1,000,000
Electrical efficiency	0.92	0.80
Annual maintenance	Rs. 160,000	Rs. 100,000
Useful life	3 years	6 years

If electricity costs Rs. 7 per kilowatt-hour, which motor should be selected if the MARR is 8% per year? Recall that 1 hp = 0.746 kW. Assume repeatability. [5]

OR

Morris Glass Company has decided to invest funds for the next 5 years so that development of "smart" glass is well funded in the future. This type of new-technology glass uses electro-chrome coating to allow rapid adjustment to sun and dark in building glass, as well as assisting with internal heating and cooling cost reduction. The financial plan is to invest first, allow appreciation to occur, and then use the available funds in the future. All cash flow estimates are in Rs. 1000 units, and the interest rate expectation is 8% per year.

Years 1 through 5: Invest Rs. 7000 in year 1, decreasing by Rs. 1000 per year through year 5.

Years 6 through 10: No new investment and no withdrawals.

Years 11 through 15: Withdraw Rs. 20,000 in year 11, decreasing 20% per year through year 15

Determine if the anticipated withdrawals will be covered by the investment and appreciation plans. If the withdrawal series is over or underfunded, what is the exact amount available in year 11, provided all other estimates remain the same? [5]

4. a. Consider that the cost of equipment is Rs. 90,000 with depreciable life of five years and salvage value Rs. 7,000. Prepare depreciation schedule for the equipment using 150% declining balance method. What are the advantages of using double declining balance method compared to straight line method? [4+1=5]

   b. A special purpose NASA fuel cell requires an investment of $80,000 and has no MV at any time. Operating expenses in year k are given by C_k = $10,000 + $6,000 (k – 1). Determine the economic life of the fuel cell if i=10%. [5]

5. a. Five mutually exclusive alternatives are being considered for providing a sewage-treatment facility. The annual equivalent costs and estimated benefits of the alternatives are as follows:

	Annual Equivalent	
Alternative	Cost (Rs.)	Benefits (Rs.)
A	1,050,000	1,110,000
B	900,000	810,000
C	1,230,000	1,390,000
D	1,350,000	1,500,000
E	990,000	1,140,000

Which plan, if any, should be adopted if the Sewage Authority wishes to invest if, and only if, the B–C ratio is at least 1.0? Justify why incremental B/C should be used for the analysis of the sewage treatment facility? [4+1=5]

   b. Consider the following two investment alternatives. Determine the range of investment cost for Alternative B (i.e. min value < X < max. value) that will convince a investor to select Alternative B, MARR = 10% per year, and other relevant data are shown in the following table. State clearly any assumptions that are necessary. [5]

	Alternative A	Alternative B
Capital Investment	Rs. 5,000,000	Rs. X
Net annual receipts	Rs. 1,500,000	Rs. 1,400,000
Market value	Rs. 1,900,000	Rs. 4,000,000
Useful life	5 years	7 years

6. Write short notes on (*ANY TWO*) [2 × 2.5 = 5]
   a. Brainstorming for idea generation
   b. Necessities and Luxury goods
   c. Demand and demand curve

Useful Formulae:

Uniform Series	Gradient Series
$(F/A, i\%, N) = \{ (1 + i)^N - 1 \} / i$	$(P/G, i\%, N) = 1/i [\{ (1 + i)^N - 1\}/\{i (1 + i)^N\} - N/(1 + i)^N]$
$(P/A, i\%, N) = \{ (1 + i)^N - 1 \} / \{ i (1 + i)^N\}$	$(A/G, i\%, N) = [1/i - N/\{(1 + i)^N - 1\}]$
$(A/F, i\%, N) = i / \{ (1 + i)^N - 1 \}$	
$(A/P, i\%, N) = \{ i (1 + i)^N\} / \{ (1 + i)^N - 1 \}$	Geometric Sequences of Cash Flows
	If $f = i$
	$P = A1N(P/F,i\%, 1)$
	else
	$P = A1 [1 - (P/F, i\%, N)(F/P, f\%, N)]/ (i - f)$