Secondary Education Examination
Model Question - 2077
Grade: 11

Time: 3 hrs Business Mahtematics (Mat.405) **F.M.:** 75

Attempt **All** Questions.

Group 'A' $[11 \times 1 = 11]$

Rewrite the correct option in your answer sheet.

1. If the demand equation for a certain commodity is $Q = a–bP$, then the expression for elasticity of demand is
   A. $\frac{Q_d}{P}\frac{dP}{dQ_d}$ B. $\frac{Q_d}{P}\frac{dQ_d}{dP}$ C. $\frac{P}{Q_d}\frac{dQ_d}{dP}$ D. $\frac{P}{Q_d}\frac{dP}{dQ_d}$

2. The roots of $bx^2 + ax + c = 0$ are equal, if
   A. $a^2 - 4bc = 0$ B. $b^2 - 4ac = 0$ C. $b^2 + 4ac = 0$ D. $c^2 - 4ab = 0$

3. If $\log_4 5 = a$,, then $\log 2$ is equal to ?
   A. $\frac{\log 5}{a} + 2$ B. $\frac{\log 5}{2a}$ C. $\frac{2\log 5}{a}$ D. $\frac{2a}{\log 5}$

4. If $y = x^n$, then $\int x^n dx$ is
   A. $\frac{x^{n+1}}{n} + c$ B. $\frac{x^{n+1}}{n+1} + c$ C. $\frac{x^{n+1}}{n+1}$ D. $\frac{x^{n-1}}{n-1} + c$

5. If $x + 2, 3x$ and $4x + 1$ are in A.P., then the value of x is
   A. 3 B. 2 C. 1 D. 4

6. If $f(x) = \begin{cases} \frac{x^2 - x}{2x} & \text{for } x \neq 0 \\ k & \text{for } x = 0 \end{cases}$
   and if f is continuous at $x = 0$, then $k =$
   A. -1 B. $\frac{-1}{2}$ C. 0 D. $\frac{1}{2}$

7. If the true discount on a certain sum for 5 months at 12% p.a. is Rs.200, then the present worth is
   A. Rs. 2000 B. Rs. 3000 C. Rs. 4000 D. Rs. 5000

8. If an equal amount is drawn at the end of each month for 6 months, the interest on drawing calculated on total drawings for an average period
   A. 2.5 months B. 3 months C. 3.5 months D. 4 months

9. A manufacturer of radio sets produced 600 units in the third year and 700 units in the seventh year. Assuming the production uniformly increases by a fixed number every year, the production in the first year is
   A. 500 B. 530 C. 550 D. 570

10. The sum of the percent frequencies for all classes will always equal
    A. one B. the number of classes C. the number of items in the study D. 100

11. You are allowed to choose four whole numbers from 1 to 10 (inclusive, without repeats). Which of the following is FALSE?
    A. The numbers 1, 2, 9, 10 have the largest possible standard deviation.
    B. The numbers 1, 5, 6, 10 have the largest possible standard deviation.
    C. The numbers 4, 5, 6, 7 have the smallest possible standard deviation.
    D. Thenumbers 7, 8, 9,10 havethesmallestpossiblestandarddeviation.

Group 'B' $[8 \times 5 = 40]$

12. The demand and supply functions of a good are given by
    $$P = -Qd + 125, 2P = 3Qs + 30.$$
    Determine the equilibrium price and quantity. Determine also the effect on the market equilibrium if the government decides to impose a fixed tax of Rs 5 on each good. Who pays the tax?

13. Given a basic Keynesian macroeconomic model: $Y = C + I, C = 60 + 0.4Y, I_o = Rs.300$ Determine the equilibrium level of national income (Y_e) and the equilibrium level of consumption (C_e). Amongst 50000 people of Nepal, a person infected by a Corona virus disease (COVID-19) had recently returned back home from a foreign country. The spread of the COVID–19 through the person body is given by the equation, $P(t) = \frac{50000}{1 + 49999e^{-0.5t}}$, where $P(t)$ is the total number of people infected at time t days.
    (a) How many people are initially infected from COVID - 19 ?

(b) The country will luck down, if 10% of the people are found to be infected from COVID-19. On what day will it close?

(c) How many people will become infected eventually from COVID-19? [2 + 1 + 1 + 1]

14. Evaluate $\lim_{x \to a} \frac{\sqrt{3a - x} - \sqrt{x + a}}{4(x - a)}$. Also find the following limits when they exist: $f(x) = \begin{cases} x + 4 & \text{for } x \geq 2 \\ 2x + 2 & \text{or } x < 2 \end{cases}$ at $x = 2$

15. The total cost C of output Q is given by $C = 300Q - 10Q^2 + \frac{1}{3}Q^3$. Find the output levels at which the marginal cost and the average cost attain their respective minima. Also, show that the marginal cost and average cost function are equal at minimum average cost. [5]

16. Evaluate:

(a) $\int \frac{6x^2 - 6x + 5}{\sqrt{2x^3 - 3x^2 + 5x - 7}} dx$

(b) $\int x \text{ In } x dx$

(2+3)

17. A small industry manufactures necklaces and bracelets. The combined number of necklaces and bracelets that it can handle per day is not more than 24. Each bracelet takes 1 hour of labour to make and each necklace takes a half hour. The total number of hours of labour available does not exceed 16. If the profit on the necklace is Rs.80 and the profit on the bracelets is 50. How many of each product should be produced daily to maximize profit? Solve the problem graphically.

18. Calculate Q_1, D_6 andP_{76} for the following data: [5]

x:	5	4	9	12	15	6	10
y:	8	6	12	8	6	9	10

19. Following are the marks obtained by two students Ram and Hari in 10 tests of 100 marks each.

Test	1	2	3	4	5	6	7	8	9	10
Marks of Ram	54	60	56	68	72	52	48	76	80	44
Marks of Hari	66	57	51	72	69	63	60	54	75	48

Who has more consistent performance ? [5]

. **Group 'C'** $[3 \times 8 = 24]$

20. (a) Define derivative. Use it to find the derivatives of $\frac{3x + 5}{\sqrt{x}}$. [4]

(b) Find $\frac{dy}{dx}$ when $y = \frac{e^x}{1 + \log x}$. [4]

21. (a) A, B and C have respectively Rs.50,000, Rs.35,000 and Rs.25,000 invested in a business. A and B receive respectively 20% and 10% of the annual profits as salary. The residue of the profit is divided among them in proportion to their capitals. If at the end of the year A receives altogether Rs.1,200 more than B, what does each receive? [4]

(b) The difference between the true and banker's discount on a certain bill due three months hence is Rs.5, the rate of interest being 4% p.a. Find true discount, banker's discount and amount of the bill. [4]

22. (a) A man has 10 friends of whom 6 are relatives. In how many ways can he invite 5 guests such that 2 of them may be relatives? [4]

(b) Ram and Shyam appear for an interview for two different posts. The probabilities of their selection are 1/4 and 1/5 respectively. Find the probability that both of them will be selected, only one of them will be selected and none of them will be selected. [4]

***