Time : 1½ Hours   <u>SECOND-TERM</u>   **MATHEMATICS & STATISTICS**

Subject Code

H	4	6	0	6

Total No. of Questions : 16   **(Printed Pages : 4)**   **Maximum Marks : 40**

INSTRUCTIONS :

(i) *All* questions are compulsory.

(ii) The question paper consists of **16** questions, divided into 4 Sections A, B, C and D.

(iii) Question Nos. **1** to **4** are VSA type and carry **1** mark each.

Question Nos. **5** to **8** are SA-I type and carry **2** marks each.

Question Nos. **9** to **12** are SA-II type and carry **3** marks each.

Question Nos. **13** to **16** are LA-type and carry **4** marks each.

(iv) There is no overall choice in the paper. However internal choice is provided in **1** question of **3** marks and **1** question of **4** marks. In questions with choices only one of the choice is to be attempted.

(v) Use of a calculator is not permitted.

(vi) Log tables will be supplied on request.

(vii) Graphs should be drawn on the answer paper only.

SECTION 'A'

Question Nos. 1 to 4 carry *one* mark each.

1.   Find the order and degree of the differential equation :

$$\frac{d^2y}{dx^2} = \sqrt[3]{1+\left(\frac{dy}{dx}\right)^2}$$

2.   Define "Sinking fund".

3.   If $P(A) = \dfrac{3}{8}$, $P(B) = \dfrac{1}{2}$ and $P(A \cap B) = \dfrac{1}{4}$, then find $P(A/B)$.
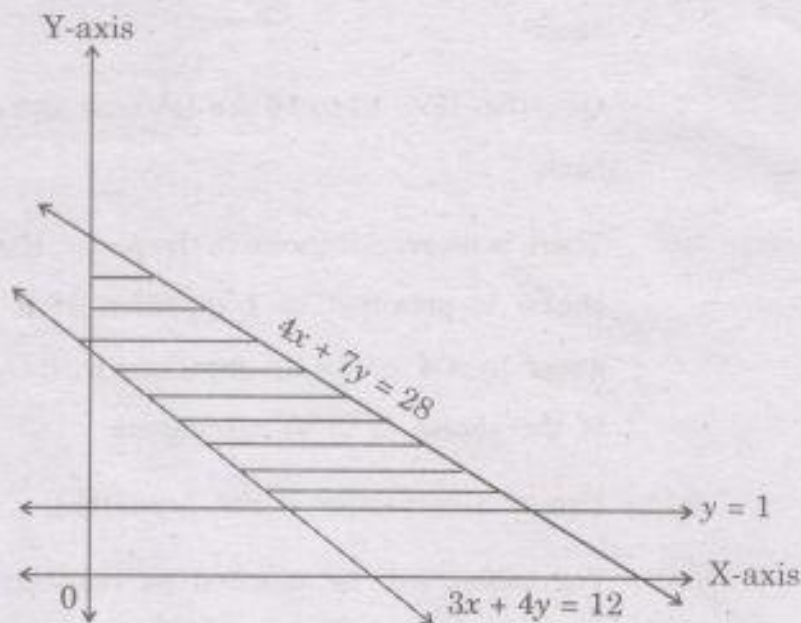
4.   Evaluate : $\int e^{2x+3}\, dx$.

SECTION 'B'

Question Nos. 5 to 8 carry *two* marks each.

5.   Evaluate $\int_0^{\pi/4} \tan^2 x\, dx$

6.   Write the constraints of the linear programming problem whose graphical solution is given below :

7. A coin is tossed 4 times. Find the probability of obtaining at least *one* head.

8. Evaluate : $\int \cot x \log(\sin x)\,dx$.

SECTION 'C'

Question Nos. **9** to **12** carry *three* marks each.

9. Evaluate :

$$\int_{2}^{7} \frac{\sqrt{x}}{\sqrt{x}+\sqrt{9-x}}\,dx.$$

10. Solve the differential equation :

$$x\,(1-y^2)\,dx - y\,(1-x^2)\,dy = 0.$$

Or

Form the differential equation by eliminating the arbitrary constants A and B from the general solution :

$$y = Ae^x + Be^{-x} + x^2.$$

11. Find the amount of annuity of Rs. 18,000 payable at the end of every quarter year for 6 years, if money is worth 12% per annum compounded quarterly. (Given : $(1.03)^6 = 1.193$, $(1.03)^{24} = 2.029$)

12. Shoes are produced by two machines A and B of which 60% of the shoes are produced by machine A and the rest by machine B. It is found that 10% of shoes produced by machine A are defective. 20% of the shoes produced by machine B are defective. If a shoe taken at random is found to be defective, what is the probability that the shoe was produced by machine A ?

SECTION 'D'

Question Nos. **13** to **16** carry *four* marks each.

13. Solve the following linear programming problem graphically :

Maximise $Z = 5x + 10y$

Subject to the constraints

$$x + 2y \le 120;\ x - 2y \ge 0$$

$$x + y \ge 60;\ x,\ y \ge 0.$$

14. Shreenika purchases a scooter by taking loan of Rs. 50,570 which is repaid in 18 annual equal instalments at the rate of 4% per annum compounded annually. The first instalment being paid at the end of each year. Find the amount of each instalment.

(Given : $(1.04)^{-10} = 0.6761$, $(1.04)^{-18} = 0.4943$, $(1.08)^{-10} = 0.4634$)

15. Show that the following differential equation is homogenous and hence solve it :

$$\frac{xdy}{dx} = x + y$$

16. Evaluate : $\int \frac{e^x \, dx}{(e^x - 1)(e^x + 3)(2e^x - 1)}$

Or

Evaluate : $\int e^{2x} \cos 3x \, dx$.