SECTION – IV

7. (a) Find the general and principal value of $\log(-1+i) - Log(-1-i)$. $3\frac{1}{2}$

(b) Solve the equation : $3\frac{1}{2}$

$$\tan^{-1}\frac{1}{4} + 2\tan^{-1}\frac{1}{5} + \tan^{-1}\frac{1}{6} + \tan^{-1}\frac{1}{x} = \frac{\pi}{4}$$

8. (a) Find the sum of sines of n angles when the angels are in arithmetical progression. $3\frac{1}{2}$

(b) Sum the series : $3\frac{1}{2}$

$$1 + x\cos\theta + x^2\cos 2\theta + ... + x^{n-1}\cos(n-1)\theta\,,\ |x|<1$$

SECTION – V

9. (a) Solve for x : $6 \times 2 = 2$

$$\tan^{-1} 2x + \tan^{-1} 3x = \frac{\pi}{4}$$

(b) Find the general value of Log (–5).

(c) State Gauss lemme.

(d) State Demoivre's theorem.

(e) Find $\phi(n)$ when $n = 68$.

(f) Evaluate $\mu(187)$.

Roll No. .....

21181

B. Sc. (Pass Course) 2nd Semester Examination – May, 2019

MATHEMATICS - I (NUMBER THEORY & TRIGONOMETRY)

Paper : 12BSM 121

Time : Three hours] ***[Maximum Marks : 40***

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt any ***five*** questions in all, selecting ***one*** question from each Section. Section – **V** is ***compulsory***.

SECTION – I

1. (a) Find the g. c. d of 858 and 325 and express it in the form m. 858+ n. 325. $3\frac{1}{2}$

(b) Find the remainder if 3^{40} divided by 23. $3\frac{1}{2}$

2. (a) State and prove Fermat's theorem. $3\frac{1}{2}$

(b) Find the general solution in positive integers of $13x - 17y = 5$. $3\frac{1}{2}$

SECTION – II

3. (a) Euler's function (ϕ) is a multiplicative function. Prove it. $3\frac{1}{2}$

(b) Prove that 2, 4, 6 ..... 2m is a CRS (mod m) if m is odd Where CRS is complete residue system. $3\frac{1}{2}$

4. (a) If p and q are distinct odd primes, then, $\left(\frac{p}{q}\right)\left(\frac{q}{p}\right) = (-1)^{\frac{p-1}{2}\frac{q-1}{2}}$. $3\frac{1}{2}$

(b) Show that $d(n) = d(n+1) = d(n+2) = d(n+3)$ $n = 4503$.

SECTION – III

5. (a) Show that there are q and only q distinct value $(\cos\theta + i\sin\theta)^{\frac{1}{q}}$, q being any the integer.

(b) Show that :

$$\tan 7\theta = \frac{7\tan\theta - 35\tan^3\theta + 21\tan^5\theta - \tan^7\theta}{1 - 21\tan^2\theta + 35\tan^4\theta - 7\tan^6\theta}$$

6. (a) Prove that :

$$\sin(\alpha + i\beta) = \frac{1}{2}\left(e^{-\beta} + e^{\beta}\right)\sin\alpha - \frac{i}{2}\left(e^{-\beta} - e^{\beta}\right)\cos\alpha$$

(b) If $\tan(A + iB) = x + iy$, prove that :

$$x^2 + y^2 + 2x\cot 2A = 1$$